CHEMICAL & METALLURGICAL ENGINEERING

Volume 46 Established 1902 Number 12

DECEMBER 1939

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Happy New Year!

It looks like 1940 will be a more interesting and prosperous year for chemical engineers. *Chem. & Met.* expects to contribute its share with an editorial program of broader coverage plus a series of special reports to chemical engineers on plant operations, processes and services. Watch for the complete announcement of plans in the January issue of *Chem. & Met.* The editors will expect and appreciate your reaction to this, the most arduous and ambitious editorial program they have yet conceived. Meanwhile, a Merry Christmas and a Happy New Year!

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THEODORE R. OLIVE, *Associate Editor* — MELVIN E. CLARK, *Assistant Editor*

Editorial Representatives

PAUL D. V. MANNING, 68 Post St., San Francisco, Calif. — R. S. McBRIDE, 712 Jackson Pl., Washington, D. C.

E. S. STATELER, 520 N. Michigan Ave., Chicago, Ill.

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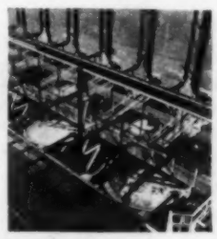

Cover picture shows absorption towers used in the process for recovering bromine from sea water in the plant of the Ethyl-Dow Chemical Co. near Wilmington, N. C. Other pictures appear in the pictured flow sheet on pages 771–774 of this issue. [*This cover space released for editorial use by the Pfaudler Co.*]

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CHEMICAL & METALLURGICAL ENGINEERING
ESTABLISHED 1902

DECEMBER, 1939

S. D. KIRKPATRICK, *Editor*

Plus Engineering

THIS YEAR'S Chemical Exposition offered convincing evidence of the mutuality of interests among chemical engineers in process industries and those in the companies that supply equipment and materials. The men found in the exhibitors' booths were almost always technically trained and serious-minded sales engineers rather than glib-tongued salesmen. Most discussions were specific and to the point. Engineering data and facts about plant operation were usually forthcoming when the inquirer had more than casual interest in the products being displayed. The Show has become, in effect, a truly chemical engineering conference.

While this stimulating experience is still fresh in so many of our minds, we would like to raise a question or two. What can be done to support and strengthen this important relationship between the man who builds the machine and the man who will put it to use in the plant? Can the benefits that arise from these biennial meetings of minds be made more frequent or continuous? In Germany, for instance, there is a unique organization popularly known as Dechema (Deutsche Gesellschaft fuer Chemisches Apparatewesen E.V.) made up of chemical engineers primarily interested in equipment design, construction and operation. In addition to the periodic Achema Expositions, this association holds annual meetings for discussion of such equipment problems as affect design, corrosion and materials of construction. It has sponsored a standardization program, and helped to establish fair and ethical trade practices.

While there seems to be no need for any more technical societies in the chemical engineering field here, we might well be giving thought to means of accomplishing some comparable objectives in this country. The most urgent, perhaps, is the matter of ethics. Nearly every equipment manufacturer we interviewed complained of some instance of unfairness on the part of purchasers. One company, after seeing its detailed specifications and drawings turned over to a rival for a competitive bid, now refuses to submit anything more than a general proposal until an agreement is reached on compensation. Only in this way can it protect its investment in engineering knowledge and experience. Another company will not make a performance guarantee on a plant or process unless its engineers have had an opportunity to check all equipment designs in advance of fabrication and erection. They report greatest difficulty in dealing with chemical companies as contrasted with petroleum refineries and pulp and paper mills. The latter process industries seem more willing to accept and compensate the equipment maker for the engineering he must build into his production.

It is this "plus Engineering" that often differentiates the ethical manufacturer from the racketeering type who will fabricate from a competitor's designs in order to avoid the costs of research and development or the paying of royalty to those who control the basic patents. Chemical equipment users who encourage this sort of thing through sharp buying practices are equally unethical, as well as being extremely shortsighted. That you get what you pay for is especially true in the equipment field.

Chemical engineers in industry and those with equipment concerns have much to gain through fair dealings and mutual respect for each other's problems and accomplishments. *Chem. & Met.* will be pleased to provide a forum for a frank and open discussion of instances of unfair treatment on the part of either the maker or user of chemical engineering equipment. Your confidences will be respected.

From an

A BREAK FOR THE SOUTH

ON NOVEMBER 30 the Interstate Commerce Commission granted the petition of the Conference of Southern Governors that the class rate structure in Southern territory be placed on a parity with Northern freight rates. While the test case covered only such products as talc, soapstone, cast-iron pipe fittings, brass pipe fittings, stoves, and other metal products, it is reasonable to assume that this decision may be the forerunner of a general revision of the whole Southern freight rate structure. This will eliminate a present differential which gives the Northern manufacturer an average advantage of 38 per cent.

Such an important reduction in the cost of delivering products to the consuming centers in the East is important in many ways. It should remove one disadvantage which has tended to discourage the management of some process industries from locating plants below the Mason and Dixon Line—plants that were otherwise attracted by raw materials, labor conditions, climatic and other advantages. This momentous decision should prove the signal for a renewal of activity in the industrialization of the South.

REPORTING TO UNCLE SAM

SHORTLY AFTER New Year's every manufacturer in the United States will receive blank forms from the Bureau of the Census on which to report quantities and values of the goods which he manufactured during 1939. Thus Uncle Sam undertakes a statistical survey of great economic importance to all process industries.

The cooperation of industry is to be taken for granted. This cooperation will be of the greatest value if it is prompt and intelligent. Promptness is necessary if the figures are to be brought together by the sincere, hard-working government statisticians in time to be of greatest value. The cooperation must be intelligent if the figures are to be reported accurately in a way that will not permit statistical uncertainty or error after they reach Washington.

There have been a number of changes of classifications of industries made for this decennial Census of Manufactures, 1939. Industries that find new forms a little confusing should not "just put in some numbers". They should make an effort to find out just what it is that the specialists in Washington desire. Then the results when they are published later in the year will be really useful, economic guideposts showing the trend and the speed of process industry.

We venture to set up a motto for use in this connection: "When in doubt about returns, write to the Bureau and find out—don't just guess!"

FLUCTUATING CHEMICAL PRICES

MUCH LOOSE TALK is heard in Washington about chemical prices. This is unfortunate. The fault lies partly with uninformed officials or self-appointed reformers, and to some degree with our own industry. It looks as though an exchange of information is needed.

Some government people argue that chemical prices are too rigid. They think that because sulphuric acid sold on big contracts does not fluctuate frequently, or even wildly at times, there must be something wrong about the pricing of this commodity. They mistakenly assume that frequency of price adjustment is an indication of the responsiveness of prices to real market requirements. That is not the case. There are few commodities on which there is more intensive competition for business than some of these chemicals for which the prices appear to be quite regular and unchanging. This is one of the points at which further understanding of the facts would help a great deal.

Then there is another group in Washington who think that prices should necessarily be cut every time there is a slight slackening in demand. This, they argue, would stimulate new consumption. They once argued this way about steel and the actual experience proved them wrong. They overlook the advantage to customers in being able to count on regular deliveries of their chemical raw materials at known prices. The fact that small shortages will not cause big upturn in prices is often more of a protection to the customer than would be any advantage that he might gain from attempting to buy at bargain prices on a fluctuating spot market. Stability of prices indicates a sound business relationship between buyer and seller in many circumstances.

Most important of all for the chemical industry is an education of public officials and critics of the industry as to the long-time downward trend in chemical prices. That there is such a trend is so well known among chemical manufacturers that it is taken for granted. But it is not a fact that is

Editorial Viewpoint

either understood or duly appreciated in other circles. It is necessary that more emphasis be given to the continuing effort of chemical makers to reduce costs and thus to reduce prices. This long-time continuing effort, which has brought results in almost unbelievable price cuts, is probably a greater service to customer industry, *and to the public*, than would be any attempted frequent adjustment "according to market conditions."

STATE ALCOHOL RULINGS

THE SUPREME COURT says "Without doubt a state may absolutely prohibit the manufacture of intoxicants, their transportation, sale, or possession, irrespective of when or where produced or obtained, or the use to which they are put." This means also that a state might even forbid production or use of industrial alsohol.

The amendment to the Constitution which terminated prohibition is considered by the Supreme Court to have returned to the states equal rights with the Federal government in this one matter of interstate commerce. Alcohol users, as well as alcohol producers, are rightly to be warned under these circumstances. It is not likely that many states will intentionally throttle responsible, law-observing industry by cutting off so essential a chemical as alcohol. But state legislatures sometimes do strange things. Each local group must be on its guard.

It is humanly possible to substitute other materials for ethyl alcohol. But let us hope that needless restrictive legislation does not force such an extreme measure on anyone. Economic and technical considerations, not some overzealous legislation, should govern these matters.

PROTECTING INEFFICIENCY

SOMEBODY in the U. S. Department of the Interior objects to the efficient supply of fuel to American industry. That is the only conclusion we can draw from the efforts being made by its Bituminous Coal Division to prevent extension of natural gas pipe lines into certain territories. Thus the government takes a highly partisan stand that is definitely against the best interests of fuel-using industries.

The reason for this obstructive practice is clear. The Department of the Interior considers itself as an agency which must protect the coal producers and particularly the coal miners. There can be no doubt that these coal interests need help. In many areas they are not delivering fuel at as low a cost as the natural gas men can achieve. Some of the reasons are obvious. Other reasons lie in weird philosophy of a social nature.

If the Interior Department succeeds in persuading the Federal Power Commission that some of these gas pipe lines should not be built, then Secretary Ickes can boast of the jobs he has saved for the coal miners; but he will have directly increased the cost of manufactured goods to the general public. It would seem as though some element in industry wanting to use cheap energy might also take a part in these proceedings by becoming self appointed spokesmen for natural gas.

ADVICE TO THE LOVELORN

"GIRLS, if you want to be happily married, pick out a chemical engineer. If possible get one between 28 and 30, who goes to church and Sunday school and has plenty of friends although not too many of the opposite sex. If you can't find a chemical engineer, next best choice is a minister or college professor. But don't marry a traveling salesman or a mechanic unless you want to run the chance of being only half as happy or maybe five times as unhappy."

No, these are not the words of Dorothy Dix. They are our own editorial interpretation of scientific data based on nine years of research by Drs. Burgess of Chicago and Cottrell of Cornell and factually presented in their new Prentice-Hall book on "Predicting Success or Failure in Marriage."

The "Happiness Rating Chart" produced by these two eminent sociologists is something every eligible chemical engineer should have in his personality file. Here are plotted the "unhappy," "average," and "happy" marriage percentages for 60 different occupations. Laborers, traveling salesmen and mechanics are at the one extreme with 40 per cent of their wives unhappy, 25 per cent just "average" and less than 40 really happy. Halfway down the list we find the factory foremen, dentists, lawyers and advertising men. But at the very bottom are the chemical engineers. Less than 7 per cent of them are unhappily married and another 7 per cent are getting along tolerably well, while the remaining 86 per cent seem to have discovered the true secret of marital happiness. As a profession, we must congratulate ourselves. We never knew that as "mere husbands" we rated quite so high.

Achievement *Via* Group Effort

AS ANNOUNCED last month, the biennial* Chem. & Met. *Award for Chemical Engineering Achievement was won for 1939 by Standard Oil Development Company. Actual presentation of the plaque was made by Webster N. Jones, chairman of the Committee of Award, at a testimonial dinner held December 4 at New York's University Club. Acceptance was made by Frank A. Howard, president of the recipient company (at right).

PRESENTATION

WEBSTER N. JONES
Chairman
Committee of Award

IN 1932 this country was in the throes of the great depression. Industry, production, consumption, distribution were at their lowest point. People were in such low spirits that hope seemed permanently dead.

As always, there seemed to be a few who kept the faith, who were willing to carry the torch. I refer here to those companies which had faith enough in their research organizations to keep them intact, to support them, to encourage their efforts. It takes courage to do that; it takes vision to do that. Every sign pointed the other way. But not for these industrial leaders. What prospect did they have that the efforts and resources expended in research would ever have anything but a fruitless reward? This was the condition in the face of a nationwide state of nerves. Their maintenance of research organizations as the first line of defense against the inroads of the depression is inexplicable. All I can say to aid you in understanding it is that it is the American way.

At that time, in order to give encouragement to the research organizations in chemical engineering and to show them that their efforts were being appreciated and recognized, there arose in the exceedingly creative editorial offices of *Chemical & Metallurgical Engineering*, the idea of giving some sort of award to the company making the most outstanding contribution in chemical engineering. It was decided that the award should not go to any one individual, but to a group, for after all it is the group that produces. Of course it will have leadership, it will have administrative support, it will have able specialists. But in the last analysis, just as the football team, rather than the elusive halfback, brings home the victory, so does the research team—to the last man—make its contribution. The curious part about it is that the research organizations would prefer it that way. They know that when every man in the organization forgets self sufficiently to combine his efforts with those of the group, the united effort is going to insure results.

You can easily see that the award neatly marks off the profession of the chemical engineer from all others—from chemistry, from mechanical engineering, from electrical engineering, from metallurgical engineering. In brief, the profession, by sheer force of its power, its satisfaction of a need, gained its own birthright, won its own place among the great professions.

It would be an anomalous situation if such a profession, so young, so vigorous, so fired, did not have its ideals, its objectives, its aims. And it does. And the nice part about it is that, fostered and nursed through stress and hardship, these dreams and purposes are realistic, not fantastic or ineffectually realistic. In the face of human suffering and hardship, in the presence of human need and want, with plenty and poverty joined to present to the world one of the most unhappy pictures of civilization, you could hardly expect the chemical engineering profession to remain oblivious to the social problems that scientific and technological development had produced. By changing the inordinately wasteful processes of the twenties, it gave to the suffering social order new products from what was once regarded as useless and even harmful; by its medicinal compounds, it relieved human suffering. It made new industries; it made new work; it made new products. In brief, I wonder whether anyone will deny that the efforts of the profession have alleviated the ravages of the depression. I know that it has saved our natural resources. It has made our country self-sufficient, as it had almost made Germany self-sufficient. And it

occurs to me that the profession, by providing the have-not nations with what they need, will eventually be the means of averting war. We cannot expect this to happen in a country where private enterprise is not free, where democratic principles do not flourish.

I cannot leave this discussion without a word about those who are to follow in our footsteps. Because I am so intimately concerned with education, I should naturally tell you about the embryonic chemical engineers. Of them let me say that they are getting their feet on the ground. They are being drilled in the fundamentals. In the engineering councils —E.C.P.D. and S.P.E.E.—the discussion is on the fundamentals of the natural sciences, of mathematics. Where there has been ineffectual duplication, it has been eliminated. The inclusion of those courses tending to develop individual manipulative skills, which industry so often recommends, is being sedulously avoided.

To this training is being added a very definite emphasis on the power of expression. Responding to the judgment that true culture is evidenced in a knowledge and competency in the use of the mother tongue, engineering educators are devoting more and more time to English. In the past there seemed always to be a gap between English and technical courses. By a closer cooperation between the several technical departments and the department of English, the happy conclusion of developing a desire for good English on the part of the students is being achieved.

In addition to these developments —and this is the great change in chemical engineering education— there has been evolved a social relations program. In accordance with this new plan, the liberal studies, such as history, literature, psychology, economics, and the like, become a part of a coordinated curriculum. Course lines are eliminated. Principles are seen in the light of social development and change and not alone in themselves. The students are made conscious of the social and economic problems that are needing study and solution today. Moreover, this work is closely integrated with their professional training. It is our feeling that our young chemical engineering students, grounded in the principles of their professions and the fundamentals of the social order of which they are a part, will be able to take a place in the future equipped and competent to make a contribution.

Thus the young giant is attaining its majority. It is gaining in strength and prestige. And though built in accordance with scientific specifications, it is no Frankenstein, but is equipped with a heart and soul that are large enough to make its love of humanity prevail.

It seems that the "little" 1932 scene upon which I raised the curtain for you earlier has become a broad panorama of the history of chemical engineering. Not only that, it is something to have been a part of that history and development, to have inspired and carried it forward as has *Chemical & Metallurgical Engineering* in sponsoring this award. We are all aware of the effects of this award in the large, but not so much in its influence in those quiet and unspoken ways.

It is proper, too, to reflect that while there is one prize, all profit in the striving. As Saint Paul says, "Know ye not that they which run in a race run all, but one receiveth the prize?"

This, of course, means that we have one to whom we award the bronze plaque, but that we also have the many more who made the struggle and who are better and enriched for doing it.

I am happy to report that the Committee arrived pleasantly at its decision this year. It selected the Standard Oil Development Company as the recipient for this 1939 award. The Committee was impressed by the number of important achievements of this productive group, and especially gratified to find a technically trained executive at the head of a great technical organization in which hundreds of chemical engineers have found a greater opportunity to grow and develop into positions of responsibility and respect.

It is with a keen appreciation of that company's outstanding accomplishments in developing new aviation fuels and other synthetic products from petroleum that I officially present to the Standard Oil Development Company this bronze plaque that symbolizes the 1939 award for chemical engineering achievement.

ACCEPTANCE

FRANK A. HOWARD,
President
Standard Oil Development Company

THIS AWARD is perhaps the most thoroughly modern and realistic of all scientific distinctions because it is given for achievement in chemical engineering, the newest major department of the applied sciences, and is conferred upon an organization rather than an individual. First, I must express to *Chemical & Metallurgical Engineering*, the donor, and to the distinguished Committee of Award my thanks and the thanks of my hundreds of coworkers for the generous appraisal of our accomplishments which led them to select us for this honor. Then, if I may, I should like to tell you why I believe this award to an organization rather than to an individual is a sound evolution of the custom of conferring honors upon those who have led in the advance of science. There is no better way to do this than to use the Standard Oil Development Company and the aviation fuel problem as examples of the present relations of industry and science.

Standard Oil Development Company is one of several hundred companies, affiliated in varying degrees and operating in virtually every country in the world, which belong to one family, the Esso family, headed by the Standard Oil Company (New Jersey). The Esso family has 134,000 employees, and produces, transports, refines and markets about 100,000 tons of oil and natural gas daily. It competes for the oil trade of the world with a few similar widely scattered families, some foreign-controlled and some American-controlled, and with an indefinitely large number of local competitors in the various nations, including the government itself in many cases.

The Esso family is therefore a rather complete cross section of modern world industry and its problems are in general the problems of the present-day industrial world. Among these problems one of the foremost is to keep the cost and quality of the equipment, the processes and the products abreast of, or if possible a little ahead of, the two factors which control the destiny of all business enterprise—demand and competition.

For the Esso family, that is the particular function of the Standard Oil Development Company. To carry these responsibilities it requires a

technical organization of about 1,500 men, the scope of which is indicated by its departmental divisions. Its business divides generally into four main functions: Research and Development, Technical Service, Technical Supplies, and Patents and Contracts.

100 Octane Gasoline

This, then, is a thumb-nail picture of the type of organization on which modern industry relies for its technical progress. Let us now turn to a typical problem of industry and retrace the main lines of attack by which the industry reached its objective. The concrete statement of this particular problem was, that it was necessary to produce a commercial super-fuel of about 100 octane number, suitable for airplane engines. In this case it was a forecast of demand, not competition, which in the first instance presented the problem, and the recognition of this coming demand and its appraisal as serious and permanent was itself an indispensable step which could be taken only on a sufficient background of technical evidence. Economic calculations showed that for a certain small but commercially important amount of business, the aviation consumer would certainly pay a price several times as great as the normal gasoline price for a fuel of 100 octane, because he could get 25 per cent increase of power with the same engine weight by taking full advantage of the power possibilities of the 100 octane fuel through higher supercharging; or 15 per cent less consumption, if advantage were taken of the fuel solely by raising the compression ratio of the engine. The balance between these maximum power and maximum economy characteristics could be made to meet the service for which the engine was designed. The important thing was that before we could really proceed we had to have sufficient engineering and economic data to show that it was worth spending a great deal of money (perhaps several hundred thousand dollars) in attempting to provide a commercial super-fuel for the aviation industry.

Making such a fuel was from the outset a chemical engineering problem rather than a straight chemical problem because we already had the two basic chemical reactions. These two reactions were the selective polymerization of isobutylene by sulphuric acid from an impure mixture of this gas with other refinery gases, and the hydrogenation of the resulting di-isobutylene to saturate its free bonds and give iso-octane itself. To the first of these reactions we were able to apply the experience of fifteen years in the production of alcohols from olefines by absorption in sulphuric acid. For the second operation we were compelled to draw on an entirely separate line of experience and engineering data resulting from our development of the destructive hydrogenation process, applied to mineral oils, by the use of sulphur-immune catalysts. The two operations passed in succession through two stages of laboratory and small-scale development, and emerged as a completely engineered commercial process, operating on a scale of approximately 200 barrels per day. Iso-octane of sufficient purity, in amounts which were small but adequate to develop the business, was available. The initial production cost was high as compared with normal gasoline but it was commercial.

It was than found that isobutylene could be polymerized or condensed with normal butylene by modification of the acid reaction above described to yield an 8-carbon-atom branch chain unsaturated hydrocarbon which, when hydrogenated, was nearly as good as iso-octane itself, and of lower cost and far greater potential output.

The latest stage of development was an extremely interesting process, identified perhaps rather indefinitely from the chemical standpoint as "alkylation." By this process a low molecular weight branch chain paraffine hydrocarbon is made to unite with a similar olefine to produce directly a saturated branch chain hydrocarbon of the desired molecular weight and volatility characteristics. Through this technique isobutane and butylene unite to form an 8-carbon-atom saturated branch chain hydrocarbon, apparently the same as that which is produced by the polymerization of isobutylene and normal butylene and the hydrogenation of the polymer. The alkylation reaction is already commercially applied to 3, 4 and 5-carbon-atom hydrocarbons. Depending upon the purity of the starting gases, it produces a more or less complex mixture of virtually saturated hydrocarbons of very high octane number. At the present time there are about 15 large commercial alkylation plants in operation or building, with a total production probably between 10,000 and 15,000 barrels a day.

Up to the time of development of the alkylation reaction, commercial fuels consisted of a base stock which was ordinary high quality aviation gasoline, plus the synthetic blending agents which I have just described (i.e., iso-octane itself, or one of its technical substitutes) plus tetraethyl lead. Usually the base stock made up considerably more than half of the total mixture, so that an accurate description of the super-fuel was that it consisted largely of a normal high quality aviation gasoline, blended with a synthetic hydrocarbon and with tetraethyl lead to raise it to the "super" level. With the development of the alkylation process the distinction between blending stocks and base stocks has almost vanished. The complex reactions which occur in the alkylation process produce a wide range of hydrocarbons which can very closely approximate the physical composition of ordinary aviation gasoline while still retaining the characteristic of extraordinary resistance to detonation which makes the product a super-fuel. The super-fuel of the present day is still mainly the blended product; but the aviation super-fuel of tomorrow may be almost completely a true synthetic product which has been built up by the chemical combination of simpler hydrocarbons.

What's Ahead?

We are so breathless with the progress already made, that few of us are able to see where this road along which we have moved so rapidly over the last few years will lead us. Apparently it is leading us in the direction of converting the natural hydrocarbons of petroleum into simpler compounds of low molecular weight, and then recombining these simpler compounds in new ways to obtain an entirely new molecule having the characteristics that we want, and which we cannot obtain in the natural molecule. This route of development along the lines of true synthesis is, however, paralleled by a companion route which, up to this moment, seems economically much more attractive for the basic products of the oil industry such as motor gasoline. The alternative route is the chemical modification rather than the chemical synthesis route. The earliest and greatest single step in the chemical modification route was of course the process of thermal cracking, by which

we now make half of our motor gasoline supply from heavier oils. The hydrogenation process was the next great step forward along this line. It introduced the principle of directed alteration of the natural molecule in place of the brutal decomposition of the thermal process. The force employed to direct the alteration in the hydrogenation operation was the catalyst. No one has yet produced a full equivalent of isooctane by this alternative route, but tomorrow someone may do it, thus bringing progress on the second and broader economic highway abreast of progress along the true synthetic highway.

But the synthetic highway has also its own economic reserves. The simplest of all the hydrocarbon building blocks through which hydrocarbon structures might be erected is methane itself—the predominant constituent of natural gas. Few of us realize that the actual tonnage of natural gas reserves in the U. S. is a very large proportion of the oil reserves, and that the cost per ton of natural gas in the field is comparable with that of oil. At the present time it is much lower in many instances, due to lack of market. When we can find how to utilize methane itself in chemical synthesis, the economic disadvantage of the true synthesis route, as compared with the route of catalytic modification of the natural heavy hydrocarbon, will disappear, and the race will be even.

Perhaps an insight into the significance of these technological advances would be worth while. I think they indicate the possibility of an automobile engine half the size of the present engine with some increase of power, and with a mileage per gallon twice the present average. Almost certainly, the improvement will be taken up partly in increased power and partly in increased economy, just as has been the case with the airplane engine. These results can be accomplished by small-displacement, high compression, highly supercharged engines, with super-fuels.

I started to tell you why I thought that an award for organization achievement rather than for individual achievement was a thoroughly modern and realistic form of award for advance in science. I have not stuck very closely to the text of that thought, but perhaps these random remarks have given you some clue to my reasoning. It is not an accident that during the twenty years in which my hundreds of co-workers have been pulling together to make their regular quota of contributions to the progress of science, there has not been a single instance in which even the inventor himself has thought that it would be fair to his associates to give the process or the product his name, or to hold himself out before the public, or even before the scientific world, as entitled to stand alone in receiving the credit for the complete finished technical achievement. Our organization has never had any rule, written or unwritten, to this effect. I am sure that we would welcome an opportunity to single out one of our group for that kind of individual recognition; but so far, we have never found a man who would stand for it. And this brings me to the last point which I should most certainly make—which is that in very few instances is it possible even for our organization as a whole to claim the sole and entire credit for an important achievement in chemical engineering. In the particular field of production of aviation super-fuels for which the Committee of Award has especially singled us out as worthy of commendation, we are indebted at every stage of the development to contributions from other organizations—often our competitors.

I have tried to paint for you the picture of industry as a whole, now striving through improved technology to improve the world we live in. The important thing about this new effort, and what is perhaps the most characteristic thing about it, is that while it operates upon the foundation of individual rights and free competition, it actually works by group effort built upon individual effort and by cooperation built upon competition. The individual effort persists, at the bottom, and the competition persists. They are as essential as life itself in a vital society; but in the field of engineering they are being intelligently controlled.

Award dinner at the University Club, Dec. 4, 1939. At the speakers' table, left to right, are R. T. Haslam, vice-president of S. O. of N. J., Mason Britton, vice-chairman of McGraw-Hill, Lammot du Pont, president of E. I. du Pont de Nemours & Co., E. J. Sadler, vice-president and director of S. O. (N. J.), J. H. McGraw, Jr., president of McGraw-Hill, F. A. Howard, president of S. O. Development Co., S. D. Kirkpatrick, Editor of *Chem. & Met.*, W. N. Jones, president of A.I.Ch.E., R. P. Russell, executive vice-president of S. O. Development Co., Prof. W. K. Lewis, M.I.T., and L. H. Baekeland, president of the Bakelite Corp.

Our Chemical Industry in War Time

When at war the United States Army and Navy need 1,200 materials which have no peace-time counterpart. The procurement of these and other critical and strategic materials is a problem which must be worked out to the best interest of both Government and industry before an emergency arises.

C. S. ROBINSON

Department of Chemical Engineering
Massachusetts Institute of Technology
Cambridge, Mass.

CHEMICAL ENGINEERS will play an important role in industrial mobilization for war. Products of their skill and ingenuity are, for the most part, products even more essential in war time than in peace. Many will require special processes not now in use because of a different raw materials situation. Others will be products not used in civilian life and therefore requiring much chemical engineering technique. Consequently, all persons engaged in chemical plant operation should ask themselves, "How will industrial mobilization affect me and my plant?"

Many chemical engineers may not be familiar with the National Defense Act of June 3, 1916, which, as amended, is now the law of the land. Quoting from Section 120 of that act:

"The President, in time of war or when war is imminent, is empowered, through the head of any department of the Government, in addition to the present authorized methods of purchase or procurement, to place an order with any individual, firm, association, company, corporation or organized manufacturing industry for such product or material as may be required, and which is of the nature and kind usually procured by such individual, . . . or organized manufacturing industry."

"Compliance with all such orders for products or material shall be obligatory on such individual, firm . . . or . . . industry or the responsible head or heads thereof and shall take precedence over all other orders and contracts theretofore placed with such individual, firm . . . or . . . industry, and any individual, firm . . . or . . . industry or the responsible head . . . thereof owning or operating any plant equipped for the manufacture of . . . any necessary supplies for the Army, and any individual, firm . . . or . . . industry . . . owning or operating any manufacturing plant, which, in the opinion of the Secretary of War shall be capable of being readily transformed into a plant for the manufacture of . . . necessary supplies . . . who shall refuse to give to the United States such preference . . . or who shall refuse to furnish such supplies . . . at a reasonable price as determined by the Secretary of War, then . . . the President . . . is hereby authorized to take immediate possession of any such plant . . . and the responsible head or heads thereof . . . shall be deemed guilty of a felony . . . ."

"The compensation to be paid any . . . company . . . for its products . . . or as rental for use of any manufacturing plant while used by the United States, shall be fair and just."

"The Secretary of War shall also . . . cause to be made a complete list of all privately owned plants in the United States equipped to manufacture arms or ammunition, or the component parts thereof. He shall obtain . . . complete information regarding the . . . equipment in each plant, and the maximum capacity thereof."

Furthermore the courts have ruled that this section imposes a duty on a manufacturer to comply with an order of the United States for war supplies, although such order may prevent him from carrying out earlier contracts with private persons.

This section of the National Defense Act gives the President extremely broad powers in time of war or when, *in his opinion*, war is imminent. However, like all acts of this character, such powers can only be enforced when backed by public opinion and the President would presumably invoke them only if he were certain that he would be upheld by the country as a whole. It should also be emphasized that compensation shall in all cases be fair and just, and by implication, to all parties concerned.

Included among necessary supplies for the Army and therefore falling within the scope of Section 120, are three classes of materials—strategic, critical and essential materials which are neither strategic nor critical.

Strategic materials are those which come mostly from overseas and which, if cut off by a blockade, would seriously affect the national defense. The best known example of a strategic material is rubber of which this country uses about one billion pounds each year, most of which comes from the East Indies. There is perhaps a six months' stock on hand and if that were used up, it would be necessary to make use of reclaimed rubber and expensive synthetic substitutes. In addition to rubber, the following materials are considered strategic: aluminum, antimony, chromium, coconut shell charcoal, ferro-manganese, manila fiber, mercury, mica, nickel, optical glass, quartz crystals, quinine, silk, tin, tungsten and wool.

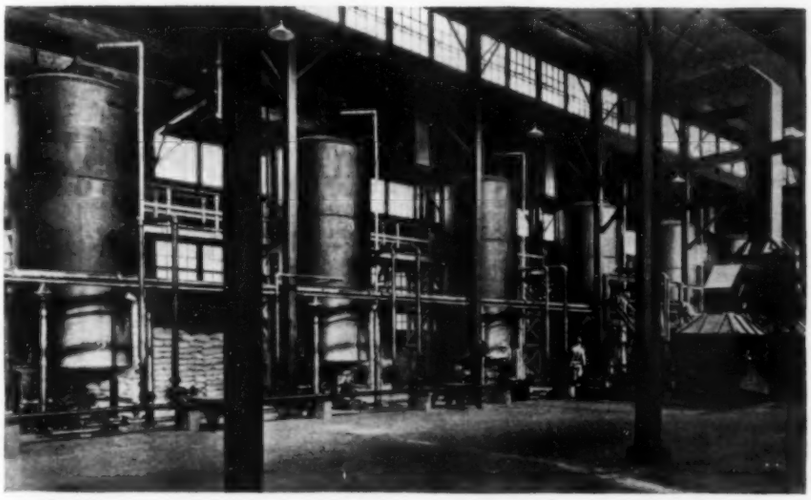
Substitutes for some of these materials are being made available. For example, a synthetic mica has been developed at M.I.T. which appears to be the equivalent of natural mica for almost every purpose.

Critical materials are those which are produced in this country but in insufficient amount for war purposes and civil purposes combined so that special arrangements including restricted use for civil purposes would have to be made to procure enough of them for military use. The following materials are considered critical: asbestos, cadmium, coffee, cork, cryolite, flaxseed, fluorspar, graphite, hides, iodine, kapok, nux vomica, opium, phenol, picric acid, platinum, scientific glass, tan-

Based on a paper presented Nov. 15, 1939, before the American Institute of Chemical Engineers at Providence, titled "Our Chemical Industry in the Next War." Prepared Aug. 1, 1939.

ning materials, titanium, toluol and vanadium.

Essential materials make an imposing list which is beyond the scope of this article to present in detail. Among the Mineral and Metallic Materials group will be found abrasives, aluminum alloys, ferro-alloys, non-ferrous metals, petroleum products, refractories, iron and steel and non-metallic minerals. Among the Chemicals group are found alcohol, acids, alkalies, coal tar products, charcoal, medical supplies, glass, and many others. And in the Animal and Vegetable Materials group are vegetable fibers and their products, foodstuffs, hides and tanning materials, pulp and paper, rubber products, silk, vegetable and animal oils, and wool products.



Chloropicrin, an important war gas, was made during the World War by passing live steam through picric acid and bleaching powder in this plant

The list of essential chemicals (taking the word in its narrowest sense) which will be required in large amounts by the Army and Navy for the manufacture of explosives and war agents, is still a considerable one. Included in this list are:

Acetic Acid	Methanol
Acetone	Nitric acid
Ammonia	Phenol
Benzol	Picric acid
Caustic soda	Potash
Chlorine	Soda ash
Ethyl alcohol	Sulphuric acid
Hydrochloric acid	Toluol

The bulk of these chemicals go into the manufacture of explosives of various sorts and chemical agents. Practically all modern explosives are mixtures of nitrated organic compounds which require the use of sulphuric and nitric acids in their manufacture. Ammonia goes into ammonium nitrate, which is likely to be most widely used in high explosives, and into ammonium picrate which is used in armor-piercing projectiles on account of its insensitive character. Acetone, acetic acid, and the alcohols are used as solvents for lacquers, plastics and smokeless powder. Chlorine is the basic raw material used in the synthesis of most chemical war agents such as mustard gas, chlorpicrin, etc. Toluol is the basis for the famous T.N.T. and is largely used in other, less widely known, kinds of explosives.

Many of these chemicals cannot be used for the manufacture of munitions in their usual commercial purity and must be subjected to additional purification to meet Army or Navy specifications. The degree of purification required in certain explosives like gun-cotton and T.N.T. seems excessive until it is realized that ammunition is subjected to extremes of temperature and humidity and must function perfectly notwithstanding. It is no exaggeration to say that many of the fires and explosions which have occurred at one time or another in munitions plants and storage depots have been due to materials which have been insufficiently purified.

None of the above list is strategic, but phenol, picric acid, and toluol are classed as critical. In other words, these three substances are produced in insufficient amount in this country to supply the war-time needs of the Government in addition to the civilian requirements. Of the three, toluol is the most conspicuous. So far as the writer is aware, the only sure sources of this material in any reasonable amount are the byproduct coke ovens. When running at full capacity, these ovens will produce a large amount of crude toluol, which must be highly refined before it can be successfully nitrated for ammunition purposes.

It will be noted that none of the chemicals listed is used in ammunition as such but is a raw material for the manufacture of the particular explosive or chemical agent. At the present writing, there are in this country virually no plants for the production of military explosives on a war-time scale. Furthermore, there is little likelihood of any such plants being built until after war is declared. It is hoped that at that time, the majority of the plants needed will be built by private concerns so that the Government will not be required to go into manufacturing and can devote its entire energy to the prosecution of its direct military efforts.

Keeping in mind this brief picture of the problem, we may now proceed to outline the present plans of the Government when war is declared. But first let us refer again to Section 120 of the National Defense Act and to that paragraph quoted regarding the list of privately owned plants prepared by the Secretary of War. The preparation of this list has been delegated to the Assistant Secretary of War, who, under Section 5a of the same Act, has been "charged with the supervision of the procurement of all military supplies and other business of the War Department pertaining thereto and the assurance of adequate provision for the mobilization of material and industrial organizations essential to wartime needs." However, since the Assistant Secretary of War has no authority to deal with matters pertaining to the Navy and since the Navy is equally interested in this sort of work, there was organized in 1922 a joint board for that purpose called the Army and Navy Munitions Board. By Executive order of July 5, 1939, this board was made directly responsible to the President. It has undertaken the preparation of the list referred to and has practically completed the work at the present writing.

Simultaneously with the preparation of the list of plants, there has been

worked out with the approval of the Army and the Navy what is called an "Industrial Mobilization Plan." This plan has been printed and may be obtained from the Superintendent of Documents, Washington, D. C., for 15 cents, and should be in the hands of every person who expects to be affected by Section 120 of the National Defense Act. This plan does not have the force of law at the present time but upon outbreak of war, present legislation together with proposed new legislation which has been prepared for the purpose, will most likely permit its application in substantially its present form. Its object is to utilize most efficiently the war powers of the President, the authority likely to be accorded by Congress, the war-time power of commandeering, and the force of public opinion.

Among the principles to be followed in this plan are:

1. The prompt procurement of raw materials.
2. Due consideration to the *essential* needs of the civil population.
3. The least possible disturbance in the normal economic life of the country.
4. No competitive bidding among various Government departments.
5. The proportional division or "allocation" of industrial resources between the Army and the Navy.
6. The peace-time education of industry in regard to war-time problems.

In connection with the fifth of these principles, the country has been divided into districts and the war time requirements of the Army and the Navy have been allocated to each district in proportion to the production facilities of that district for the material in question. For example, the procurement requirements of the Ordnance Department, which must supply the Army with all its guns and ammunition, tanks and combat cars, and fire control instruments, has resulted in the country being divided into sixteen Ordnance procurement districts. The work of each district has been subdivided according to the material to be procured. The more important plants in each district making an essential material, or interested in so doing in war time, have been or will be approached by representatives of the government and asked to sign an agreement to the effect that the plant in question will be willing in time of war to undertake to produce that particular material for the government in the amount and at the agreed rate.

In connection with the sixth principle mentioned above, under authorization of the Act of Congress of June 16, 1939, certain of these plants which have already accepted war-time production schedules have been awarded educational orders for the product which they have agreed to make, so that they can gain experience in the problems of production ahead of time.

Specifically, the more important measures applicable to the control of industry in war include (1) priority control, (2) price control, (3) commandeering, (4) control of foreign trade and (5) organization of Governmen corporations.

Priority control will accomplish three things. It will direct the flow of materials and labor into the channels of supply of the war-making agency. It will divert the use of resources from non-essential needs into channels of essential production. And it will assure the equitable distribution of what is left to the civilian population.

Price control will be needed to call into production high-cost producers who cannot operate profitably in peacetime to make up diminished supplies for civilian uses, to curtail reckless Government buying, to allow for high-cost production due to the substitution of unskilled labor to take the place of drafted skilled labor, to take care of increased insurance, interest and taxes, to stimulate essential imports and to counteract the effects of inflation.

The third measure, commandeering, the method authorized in Section 120, is to be used as a last resort.

When War Is Declared . . .

Now, let us suppose that war has been declared and that your plant, which manufactures sulphuric acid, has previously signed a production schedule with the Ordnance Department of the Army for that essential material. In due time there appears at your plant a government official with a formal contract between your company and the Government, the signing of which will permit your plant to start scheduled production. The kind of contract to be signed will depend on circumstances. If you have agreed to make for the Army a quantity of acid not greater than four-fifths of your 24 hour per day production, and the Government proposes to leave you the remaining one-fifth free for your disposal to regular peace-time customers, you will probably sign what is called the fixed price contract. This fixed price contract differs from peacetime contracts in that it is not based on competitive bidding but is negotiated with each contractor individually so that the price agreed upon depends on the production costs of that particular plant. It also differs in that it has a termination clause and a flexible price clause relating to changing raw materials and labor costs where such changes have been made by a Federal agency under its price fixing authority.

If, on the other hand, you have agreed to make for the Army more than four-fifths of your full production, you will have to enlarge your plant. If this enlargement is done at Government expense, you will probably sign an Evaluated Fee Construction Contract which pays you a variable fee depending on how good a job you do. In this case, the new construction belongs to the Government and reverts back to the Government after termination of the contract for its disposal. However, if you prefer to build the additional plant at your own expense, you may wish to sign an Adjusted Compensation Contract which protects you against loss and which offers extra profits which depend on the savings produced and which savings are shared between the Government and yourself.

After production has started, the Government undertakes by priority and price control to insure you your fair share of raw material and of labor at reasonable prices. You will undoubtedly lose some of your peacetime labor through the draft, but really necessary specialists will be given deferred classification, and your losses will be made up by breaking in new labor outside the draft age, which at present is 21–30 years.

Your sulphuric acid must comply with Army specifications, otherwise it will not be acceptable and an Army inspector of Ordnance will be located at or near your plant so that he can keep it under constant supervision. This Army Inspector of Ordnance is also the immediate contact between you and the Government and he will undertake to act as a go-between in all cases requiring adjustments in priorities, prices and the like. It is his business to assist you in every way to fill your contract satisfactorily.

If your plant is one which has not previously signed a production schedule agreement, then in time of war, you will have to take second place on raw materials, labor, power, and so forth, giving priority to those plants which are on government contract. Also, if

(Please turn to page 759)

Behind Locked Doors in Europe

Most of Europe's chemical business is conducted behind locked doors these days. Nevertheless our two roving reporters came back from "over there" (as promised last August) with this interesting travelog written in their inimitable style.

H. W. SCHULZ *and* H. L. REICHART

IN AUGUST we told you the story of the two young chemical engineers who obtained a year's leave of absence from Carbide & Carbon Chemicals Corp. in order that they might see the world. Because of strained international conditions their visit to Europe was not as profitable as they had hoped, nevertheless their point of view regarding foreign affairs is refreshing. At right are Schulz and the 1930 Renault at the Place de la Concord, Paris.—Editor

RATTLING THROUGH EUROPE in a dashing 1930 Renault, we felt that we were doing our private bit for international understanding by obtaining first hand impressions of how Life is lived in the Old World. As chemical engineers we had a normal curiosity about seeing representative chemical plants, and noting how they compared with their American counterparts. One of the first things we learned, long before the outbreak of hostilities, was that the desire to visit a chemical plant constituted prima facie evidence of military espionage. A letter of introduction might be good for a pleasant lunch with one of the officers, but it seldom opened the gates to the plant proper. Both Imperial Chemical Industries in England and Etablissements Kuhlman in France took refuge in the explanation that the exigencies of the rearmament program robbed them of discretionary power in allowing such visits, except perhaps to the power house or the sulphuric acid plant. By contrast, the I. G. in Germany was much more hospitable, and their Höchst Works near Frankfurt is still operating despite the fact that two American "spies" were shown through most of it, late in August. Although it is normally quite impossible to discover secrets by just looking at a plant, the present reticence about visitors precluded any but the most superficial observations.

The plants we saw in England, such as the Monsanto plant at Ruabon and the Commercial Solvents plant near Birkenhead, were closely associated with American companies, and perhaps not truly representative of British practice. The Monsanto plant in Wales manufactures a variety of coal tar derivatives, starting with crude distillate. The principal products, in addition to refined coal tar fractions are phthalic anhydride, salicylic acid, aspirin, synthetic phenol and rubber accelerators. The plant itself shows evidence of a long history, marked by repeated expansions. Most of the plant dates back to a predecessor company and carries on operations in pre-world war style. On the other hand, recent additions were designed at St. Louis for processes developed in the United States. The various units were going full blast, with the exception of a neat, new plant for the synthesis of phenol, which was standing idle at the time of our visit because of a lull in the market; but since the outbreak of war this part of the plant is doubtless going at capacity as well. Labeled "typically American" by the superintendent was a little gem of a sulphuric acid plant in a drawing room setting, which was running itself with the aid of last minute control and recording instruments. The atmosphere was less home-like, however, inside one of the numerous air-raid shelters that dotted the plant in accordance with ARP regulations.

The Commercial Solvents plant we saw was just the straight-forward, immaculate duplicate of any American fermentation plant, manufacturing butanol, acetone, alcohol, and butyl and ethyl acetates. Also of interest to us was the neighboring plant of Lever Brothers at Port Sunlight, not because we saw there any startling innovation in the time-honored process of soap-making, but because the Lever housing experiment is still an outstanding example of what can be done to make an industrial community attractive. This large-scale employer has had the vision to build a model town that was conceived as an artistic whole by an able architect. Today, the distinctive buildings, carefully tended gardens, and neatly kept lawns of Port Sunlight stand in eloquent contrast to the typical, squalid industrial communities of the Midlands.

American industrial methods, characterized by continuous operation and automatic control, are finding their way into such traditional crafts as the making of fine china. When we

visited the Wedgwood Potteries, we saw how the old craftsmen were fashioning some exquisite Jasper ware to be presented to Queen Mary on her visit the following day. These pieces were then fixed in the outmoded coal-burning kilns built by Josiah himself. But we were also shown a new Wedgwood plant now being built, together with a model village, on the Wedgwood estate, where production will be streamlined with automatic kilns and electrically-heated baking ovens.

Industry and Bisquits

The evident superiority of American practice was somewhat grudgingly admitted to us by a chemical consultant in London over his cup of tea: "Of course, 'out there' in America everything is on a much larger scale, but with all your industrial prowess you Americans still don't know the first thing about baking bisquits or making orange marmalade. Show me an American cookie that can compare with our Huntley & Palmer's." We were not prepared to dispute the point, but it seemed like grasping at a mighty slim straw.

In Germany, only our visit to Frankfurt was of chemical significance. We were following the beautiful valleys of the Moselle and the Rhine on our way to Switzerland, and did not see any other part of industrial Germany because it was our intention to return for a longer stay after having explored Switzerland and Italy. We had hoped to get back by September 18 for the convention of German chemists.

Frankfurt is the chemical capital of Germany, and boasts the head offices of the principal chemical and metallurgical producers, such as the I.G., the Metallgesellschaft, and the Deutsche Gold-und-Silber-Scheidenanstalt. A large number of subsidiary companies have been absorbed into these non-competitive trusts that control mutually exclusive fields. We were cordially received by these concerns and noticed little of the suspicion and secretiveness that we had encountered in England and France. At the Scheidenanstalt, we were shown through their new research laboratories that are supposed to rank as one of the best equipped in Germany, but failed to find anything particularly impressive. It surprised us to find that some of the full-scale smelting operations of the Scheidenanstalt are carried out in an ornate building in the heart of Frankfurt.

The I.G. arranged for us to visit their nearby Höchst works where we spent the better part of a day, though much of our time was cagily devoted to an elaborate luncheon at the Casino. We were impressed with the antiquated nature of most of the process equipment, some of which, we were told, dated back to the 1890's when the first dye plant was located here. Not only was this true of the dyestuff department where the familiar batch processes are but large scale duplicates of laboratory experiments, but the stills and reaction vessels used for the manufacture of organic solvents seemed equally outmoded. It is entirely possible that the I.G. took pains not to let us see anything modern, but the nature of what equipment we did see in this important I.G. plant seemed proof to us of the non-competitive nature of the chemical industry in present-day Germany. Whether this monopolistic state is due to governmental decree favoring so-called protected industries, or whether it is due to a division of territory among the principal producers by gentlemen's agreement, it did evidently remove the necessity of worrying about obsolescence.

The present head of the Metallgesellschaft, a concern built entirely by Jewish capital, is a high official of the Nazi party, which impressed us with the close control the party exercises over key industries in the Third Reich. He queried us not about the chemical industry in the States, but rather about the tenor of American public opinion, and invited us to see not one of his plants, but a large-scale industrial housing project carried out by the State.

German Achema

In view of Frankfurt's position as leading chemical center, it has become the headquarters for the Dechema, or Chemical Equipment Manufacturers' Association, under whose auspices the German Chemical Show, the Achema, is held. In addition to seeing the plans for the 1940 exposition, we were interested to learn of the formation by the Dechema of an Institute of Chemical Engineering Research. The first problem this permanent organization has set itself is to foster research in the application of physical and chemical control methods to chemical processes. The use of automatic instruments to control process variables is urged, in frank imitation of American practice, in order to insure the most efficient use of raw materials.

Our most vivid recollection of Frankfurt, however, is not its chemical industry, but its Frankfurters. Standing at the Schirn, where the same family has been turning out red hots for the past 360 years, we consumed a pound of Frankfurters each, incomparably superior to any we had ever tasted.

Educational Methods

Perhaps the most general comment made by European executives was an expression of regret that Europe has not as yet followed the American practice of training chemical engineers as a distinct professional group. In Germany, for instance, pure chemists are in charge of chemical plants and the engineers are not much more than maintenance men. By the same token, the chemist knows little about engineering and the intimate appreciation of chemical and engineering problems is lacking. We saw nothing in Europe that could compare with a modern American plant, but then we are not qualified to make a fair comparison because we did not see the Leuna works of the I.G., or the I.C.I. plant at Billingsham, which are among the most advanced chemical plants in Europe.

The general tension and uneasiness that prevailed in Europe, while making it difficult to see industrial plants, made general travel very interesting. We were impressed with the calm resignation of the English and French to the inevitability of war, though no one expected it to come so soon. The Germans we talked to, on the other hand, all affirmed—perhaps with more hope than conviction—that there would be no war.

While in Germany, we frequently stayed at the youth hostels that are scattered all over the country. Here one can spend the night for about 15 cents and rub elbows with Germany's Nazi generation. The hostels are primarily patronized by brown-shirted boys and green-skirted girls, members of the Hitler Jugend, who swarm across the country in great numbers both on bicycles and afoot. From occasional conversations there remained no doubt in our minds of the thoroughness with which the Nazis make the German youth safe for Hitler.

Driving along the peaceful valleys of the Moselle and the Rhine in our French car, we frequently encountered long motorcades of heavy army trucks carrying guns and men to the West Wall—just the regular fall maneuvers.

we were told. As a result of these troop movements there was an acute gasoline shortage, the army having conscripted all available supplies. Driving a car with French registration, we were permitted to buy 5 liters at any station along the way, but German motorists frequently were in bad humor.

Switzerland presented a strange contrast of peaceful earth and seething humanity. Two days before the outbreak of war, a general mobilization called all men to the colors between the ages of 18 and 60. The country was bristling with soldiers in ill-fitting uniforms who amused themselves by digging trenches, setting up machine gun nests, and erecting tank barriers on highways. Unable to obtain gasoline, we obtained a rope, ice-axes, and cramp-ons and climbed the Wetterhorn. When we returned two days later to our youth hostel at Grindelwald, the quiet of this idyllic spot was torn with radio blasts proclaiming that war was on. Looking up at the Alps, the timeless majesty of its ice-covered peaks seemed to mock the stupidity of little men who deem themselves civilized, and butcher their brethren in token thereof.

INDUSTRY IN WAR TIME

(Continued from page 756)

you use in peace-time raw materials which are on the list considered critical, which means that the Government will need most or all of the country's production, you can figure on going without those materials and it might be wise to start planning now on substitutes for them.

Sulphuric acid is but one of 600,000 items which the Army will need in time of war, 7,300 of which are of sufficient importance so that special arrangements will be made to insure adequate supply. Strict procurement schedules are made for some 3,500 items, of which 1,200 are military goods having no civilian market. In regard to the latter products, it is stated that no more than 50 per cent of any single plant's capacity will be allocated to producing such items.

Steps to Be Taken by Industry

EDITORIAL STAFF COMMENT

PROFESSOR ROBINSON has set forth what the Government intends to do toward industrial preparedness. But there is another side to the story. There are certain things that industry can and should do without Government aid or supervision.

In a great many cases the manufacturer knows already that he will be expected to produce a certain item, but as yet he has received no educational order. Even under such circumstances, military men think that production studies might well be initiated by the manufacturer himself. When doing so, however, capacity estimates should be on the conservative side. Then if any improvement over the estimate is attained in actual performance, the error is on the safe side. Unfortunately, the Army and Navy have no money to pay industry for these special studies; but they hope for them, just the same.

It goes without saying that the War Department expects to find plant facilities of important industry in the best of condition. Industry will be expected to keep abreast of developments that result in increased efficiency of operation, and shop equipment should be well maintained at all times. Adequate storage space must be planned both for raw materials and for finished products. Major changes or improvements in manufacturing processes should be reported to the War Department. Information regarding new plant locations and any other evidences of progress within the industry are also wanted.

Any manufacturer, who has not already done so, certainly should check all possible sources of supply for his necessary raw materials and needed spare parts. Familiarity with the lists of strategic and critical materials is assumed. If some commodity on one of those lists is essential to the manufacturer, he might well carry a reserve stock of it. Also if possible, he should make provision for substituting some other material which is not on the strategic or critical list.

The source of electric power is a question which each manufacturer should consider. If a power plant is part of the manufacturing enterprise, it is unquestionably safe to assume that fuel will be available in any needed quantity to permit expansion to the limit of his installed power capacity. For the manufacturer who purchases power, however, or one who must purchase power above a certain capacity, the source of supply is worthy of considerable study. In this case a liberal rather than a conservative estimate should be made as to possible need for power.

One of the fundamentals of American industry is the philosophy of mass production. An equally important corollary is mass distribution. Once again both raw materials and finished products must be considered. Are the regular transportation facilities capable of handling a possible large increase in traffic, both incoming raw materials and outgoing products? If the regular facilities cannot handle it, what provisions can be made for auxiliary equipment? Highway and waterway transportation should not be overlooked, if railway transportation happens to be the only type now used.

The labor situation should be carefully studied. As mentioned above, the drafting of the skilled laborer may be deferred, *but he will probably not be exempted.* This means that a definite training program for substitutes should be provided. A skilled worker has been defined as a man who can work from a blueprint, and creating skilled labor requires a great deal of time.

Finally, it should be remembered, Army officers say, that arsenals are experimental laboratories, and not production units. Contact should be maintained with them to the extent allowed by Army regulations so that new developments and possible future demands upon industry may be anticipated. Personal contact with the procurement officer in the district in which each plant is located is also advisable.

Many companies will find that compliance with these suggestions may be to their advantage even though a state of war is never reached. And in the event of a national war emergency, the machinery will already be set up for prompt and efficient cooperation between Government and industry, thus eliminating the waste and confusion so evident when the United States entered the World War in 1917.

Nylon Plant Begins Operations

After many months of preparation the first unit of the nylon plant at Seaford, Del., commenced operations on December 15. The plant is the first of its kind ever built, designed to fit an operation never before undertaken.

MANUFACTURE of nylon yarn in the first unit of the new plant of the E. I. du Pont de Nemours & Co. at Seaford, Del., began on December 15. Production of the yarn, scheduled originally for early in 1940, has been advanced several weeks, due to the project being completed earlier than was anticipated when the construction work started January 20 last.

The plant is the first of its kind ever built, designed to fit an operation never before undertaken. The original unit is a single building, 1,052 ft. long and 272 ft. wide. Slightly irregular in shape, it is essentially an elongated, single-story rectangle, extending from a six-floor tower at one end. The roof is flat, broken by terrace-like set-backs at different elevations. Large pent-houses accommodate air-conditioning equipment, with cowls and supply ducts coiling across them.

The walls are of red brick, with plentiful window space assuring maximum daylight for the service area. The facade is relieved by concrete trim and the window openings. A temporary wall closes in one of the long sides, preparatory to a future addition.

The manufacturing process begins in the tower, reached by metal stairways. On the top level are huge insulated vessels of stainless steel. Below are other large autoclaves, extending through two floors of the building. Pipes, layer upon layer, line ceiling and walls, forming strange geometric patterns as they converge. On a lower level is a long line of shining metal canisters reaching from floor to ceiling. Each floor is devoted to a separate phase of the operation as the material flows downward through the equipment.

Electrical instruments mounted on panels guide the process with minute precision. Robot observers signal with flashing lights and chimes. Temperatures and pressures are recorded. Scales print measures of weight on ticker-tapes. Each aspect of the performance is carefully and systematically scheduled to the split second.

On the lower levels of the tower, intricate mechanisms designated as spinning units transform the nylon flakes into the slender, web-like filaments of nylon yarn. These units are grouped in batteries of 20, set in horizontal wells through the floor. From the top, they resemble circular flour sifters, shaped to fit into the apparatus. They are kept filled with the flake-like nylon chips by mobile hoppers, traveling along an overhead rail. Here the material is melted, then pumped under pressure through spinnerets. On the level below, the filaments appear, almost invisible individually as they become solid upon reaching the air. The fibers are again whisked from view down a narrow pipe-like chimney, where on the floor below they are wound on bobbins. The man-made harvest is complete as the strands spin merrily around the cylinder.

From this point, the yarn begins its progression through the various processing operations. The length of the plant is partitioned laterally into a series of long rooms, housing rows of textile machinery. Running at high speeds, these devices rotate spools and bobbins. The batteries of machines stand row on row along long aisles, the regimented ranks of modern industry. Their mission is to twist and otherwise prepare the product for industrial purposes.

After a "pre-twisting" to facilitate handling, the bundle of fibers is drawn or stretched to impart the strength and elasticity peculiar to nylon. This is accomplished by a machine which stretches the yarn between two rotating devices going at different speeds. This process is a rearrangement of the nylon molecules in an orderly, length-wise array, rather than in helter-skelter fashion like individual straws in a hay stack.

The yarn is then twisted and given a size and lubricant in preparation for knitting and weaving. After final inspection it is packaged in skeins, cones or other forms and delivered to the shipping room at the building's extreme end, where a loading platform parallels the railroad tracks.

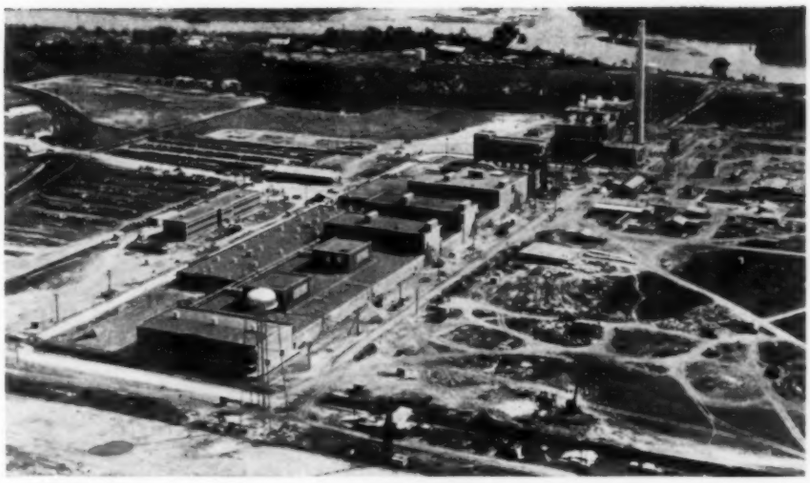
Longitudinally, the plant is bisected by a corridor separating the manufacturing from the service station. This area provides quarters for store rooms, machine shops, a control laboratory, supervisory offices, locker rooms and a cafeteria.

The air-conditioning plant is one of the most modern industrial systems of its type ever constructed. The conditioning units are housed in special rooms above the roof. Refrigeration equipment is located in the power plant. The chilled water for the units is piped in underground. Temperature and relative humidity are maintained at a constant throughout.

The plant will produce polymer, as well as yarn. Some of the polymer will be made into brush bristles and surgical sutures, among other articles, by the du Pont Plastics Department at Arlington, N. J.

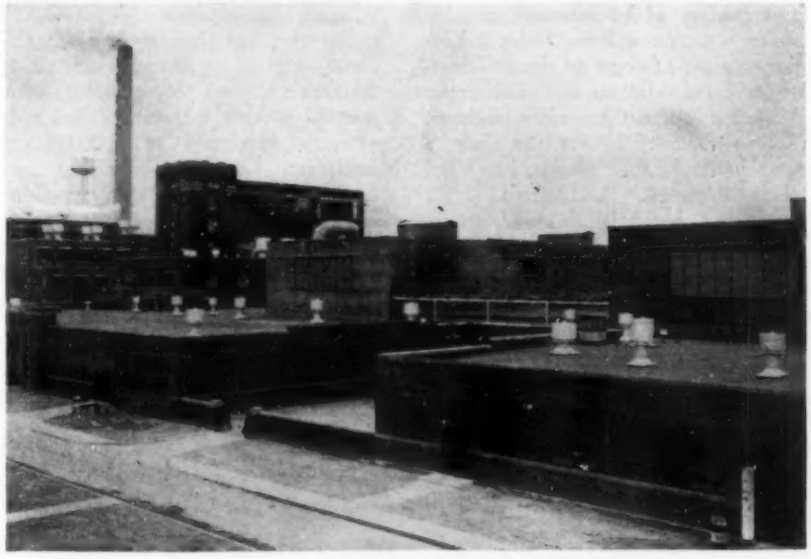
The plant, when in complete operation, will produce approximately 4,000,000 lb. of nylon yarn a year. About 850 workers will be employed.

The nylon process is begun in the du Pont plant at Belle, W. Va., which has been enlarged in the last year. The intermediates made at Belle will be shipped to Seaford.



Nylon plant of the E. I. du Pont de Nemours & Co. at Seaford, Dela. The building is one-fifth of a mile long. The power house is nearest the Nanticoke River. At left is an administration office building

Pent houses with slatted openings accommodate air-conditioning equipment. Low portion in foreground houses control laboratory and other service functions



Lower left—One of the instrument panels watching over production of nylon yarn. Precision is maintained by controls which record every activity

Lower right—Nylon yarn being processed. Here machines twist the bundle of slender filaments for ease in handling. Yarn is composed of numbers of these fibers twisted together into a single thread

Model Community at Port Sulphur

Development by the Freeport Sulphur Co. of the industrial village of Port Sulphur has gone a long way toward the solution of many of the employment and public relations problems that offer potential stumbling blocks to the nation's business.

IN A NEWLY-BORN MODEL INDUSTRIAL VILLAGE 45 miles below New Orleans among the grassy marshes and bayous of Louisiana's southern shore, a pattern is being fashioned for the solution of some of the problems of employee relations and public relations that confront American business. This community is Port Sulphur, a town of landscaped homes, carefully-planned streets, floodlighted tennis court and baseball diamond, up-to-date hospital and all the other community requirements, built on filled-in land by the Freeport Sulphur Co.

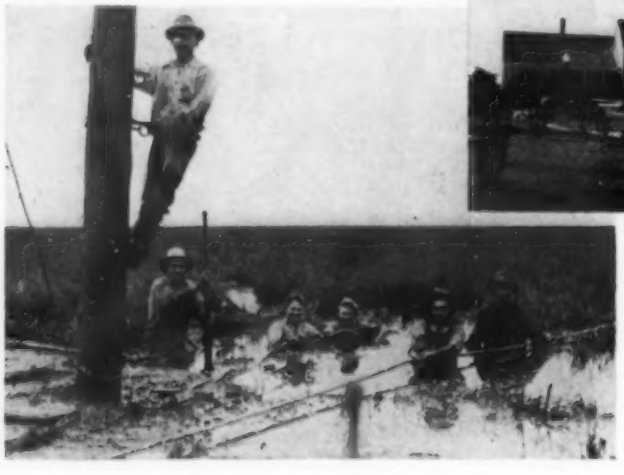
Until 1932, the present site of Port Sulphur and of the company's plant and mine 10 miles away was populated mainly by minks, muskrats and mosquitoes. A short distance from the Mississippi the river banks became desolate plains of swamps, quicksands and mats of decayed grasses floating on water or ooze. That was the setting when Freeport undertook the development of the Lake Grande Ecaille sulphur deposit.

Surveys had indicated that sufficient sulphur apparently existed to warrant a mining project but its commercial success was established only after the investment of $4,000,000 in equipment, dredging, drilling and land fills. Boiler plants, machine shops, pipe lines, water treating apparatus and all the other equipment needed for Frasch process sulphur extraction had to be constructed on a forest of 75-ft. piling. The nature of the foundation was indicated by the fact that the piles sank the first 45 ft. before being struck by a pile driver.

But this was only part of Freeport's task. The employees and their families had to have permanent places to live. Those who had been living elsewhere in the parish were of course provided for but arrangements were needed for some 600 other men, women and children. So the townsite of Port Sulphur was laid out.

Although a piling foundation was not found necessary, extensive land fills were required to lift the foundation above the maximum storm tide. A major consideration in the planning was the elimination of highway traffic from the town proper. A plot 65 ft. wide extending the full length of the residential area was set aside as a screen from the state highway running along the river edge, and a parallel, intermediate roadway connected at intervals to the highway was built.

The town plan was based on garden city principles. Houses face the



Type of "land" upon which the engineers constructed the piling foundation for the community for operators in southern Louisiana

In existence only since 1933, this town has risen from the heart of what was almost a wilderness to become a model for community life throughout the state. Homes of those who spend their working days at the plant of the Freeport Sulphur Co.

Community at Port Sulphur, La. Employees commute to work by motor launch on the ten-mile canal in the background

gardens, are set 80 ft. apart and are accessible by means of footpaths. The garage and kitchen entrances are from the "cul de sac" drive or motorway in the rear. This feature eliminates dust, traffic and noise, and places the fronts of the houses on gardens or parks instead of streets. It is, too, an added safety device, eliminating some of the traffic hazard to children. The motorways are connected with 50-ft. streets which constitute the main traffic arteries. A number of open spaces was provided for parks and squares.

Present houses provide three, four and five-room dwellings for 125 families, with five additional ones nearing completion. Climatic conditions and the material used in construction dictated the colonial-type architecture, which involved 27 distinct designs in order to obtain variety. Considerable study was given to roof lines and to the juxtaposition of types, as well as to color schemes.

Port Sulphur has many community facilities usually found only in larger and long-established towns. Among them are a well-equipped community house, theater, library, school, central boarding house for single employees, lighted tennis court and lighted baseball and softball diamonds, and a modern hospital. Heated with a thermostatically controlled oil-burning hot water system, the hospital has 18 rooms, and its equipment includes electric sterilizers and X-ray apparatus, attic ventilator fans, and laboratory accessories. A medical aid association facilitates hospitalization for Port Sulphur residents.

The community is closely knit through various social, educational and welfare associations. Focal point of community life is the community house, which has an auditorium with seating capacity of 600, as well as smaller rooms. This house and the school provide places for parent-teacher, 4-H club, athletic association, camera club, theater guild and other meetings.

Port Sulphur is highly sports conscious. The soft ball diamond is used both night and day, with local teams playing those from other sections. Games of the various leagues are well attended and create parish-wide interest. The first six-man football team in the state was organized there in 1938.

In addition to the company's relations with its employees, the town's facilities are of value in its relations with other residents of the area. These recreation, education and health advantages are available in large measure to all the people of Plaquemines Parish. Many of Port Sulphur's facilities are the only ones of their kind in the parish. The hospital, for example, was the first to be built there. The community house serves not only as a meeting place for community activities but also for gatherings of parish groups. Each Sunday it becomes the meeting-house for the Port Sulphur Church. Sports at Port Sulphur naturally have an important place in the parish's life. This policy of linking together community-parish activities of all kinds was inaugurated in the first year of the town's establishment in 1934, with a Christmas Tree celebration for all Plaquemines residents. A similar party has been held each year. The Freeport company management continually cooperates with the townspeople in furthering community and parish projects.

Port Sulphur has no company-owned stores or commissaries. In fact, all paternalism is avoided in the community life. But, although the Freeport company has not included such activities as company stores in its program, Port Sulphur is already highly self-sufficient. Two small commercial centers have sprung up along the highway on both sides of the residential area. Here, employees may buy their groceries, meats, clothes and other necessities. Surveys are made to see that prices are in line with those in effect in New Orleans. Among these outside businesses nearby are a grocery store, drug store, meat market, a theater and a post office. The community, moreover, has two doctors, a dentist and churches representing three denominations.

Although Port Sulphur homes rent below cost and many company activities naturally bring only intangible benefits, the development by Freeport of this industrial village has gone a long way toward the solution of many of the employee and public relations problems that offer potential stumbling blocks to the nation's business.

A.I.Ch.E. Features Unit Operations

Technical papers presented at the thirty-second annual meeting of chemical engineers reflect many advances in theoretical work.

Dean Webster N. Jones (left), President of the American Institute of Chemical Engineers, and A. E. Marshall, honorary chairman of Providence meeting, unwrap a replica of the earliest thermometer designed by Count Rumford in 1795. This instrument exactly copied from the original at the Royal Institute of Great Britain was presented to the Rumford (R.I.) Museum as a feature of the recent A.I.Ch.E. national convention at Providence

EDITORIAL STAFF

EIGHTEEN technical papers of interest to the chemical and process industries were presented at the Providence meeting of the American Institute of Chemical Engineers, held November 15-17. Unit operations was the subject of most of the papers although materials of construction, cost control, design and economics received attention.

At the first technical session, presided over by Dr. Webster N. Jones, two papers of widespread general interest were read. Willard Morgan described the technical industries of the State, stressing the fact that they originated from capital derived in the early sailing days. Textile industries are today, as always, a dominant activity in Rhode Island, seconded by jewelry and machinery. Chemical and process industries have been subordinated to these three but are nevertheless quite important.

Second on the program was a paper by Clark S. Robinson of M.I.T. on "Our Chemical Industry in the Next War" which elicited considerable discussion from the members. Professor Robinson described the Government's industrial mobilization plan and indicated the part chemical industry was expected to play. (For the complete paper see page 754 of this issue).

At Thursday's technical session six papers were presented. The first consisted of results of laboratory and plant tests of sewage disposal and was presented by C. W. Christenson of Hospital Liquid, Inc., and Irvin Lavine of the University of North Dakota. It showed that the addition of about 10 p.p.m. of silica (acidified sodium silicate) to 50 p.p.m. of alum speeded up materially the coagulation and settling of Grand Forks, N. D., sewage. In addition, the use of activated silica permitted a 40 per cent reduction in the requirement of alum.

Attention was called to the misapplication of diffusion equations and to their limitations in the drying of solids in a paper by O. A. Hougen, H. J. McCauley and W. R. Marshall, Jr. of the University of Wisconsin. It was shown that diffusion applies only to the movement of hygroscopic water and to water held in a single solid phase in which the water and solids are mutually soluble. Furthermore, it was established that the movement of free water held within the interstices of granular solids, on the surfaces, in interconnecting cell cavities, and among the filaments of textiles, is controlled by the forces of gravity and capillarity and not by diffusion.

N. H. Ceaglske of the University of Iowa and F. C. Kiesling of the Eastman Kodak Co. presented a paper on "Capillary Flow in Porous Solids." On the basis of experiment with a column of sand 9 in. high, they corroborated the work of Richard (J. of Agri. Res. 37, p. 719, 1928). The fundamental relation derived was that of Richard:

$$v = -k\frac{dP}{dx}$$

where v is the linear velocity, k is the permeability, P the pressure (capillary pressure or suction), and X the length of column.

A simplified method of calculating drying time was described by J. C. Brier and A. S. Foust of the University of Michigan. It was shown that the logarithmic mean drying rate can be applied to the falling rate period of drying if the drying rate curve is a straight line. Cases where the curve

is not a straight line are also discussed.

Wasting of time, energy and materials occurs in every chemical plant. By making slight adjustments in the location of equipment, use of different kinds of apparatus and coordinating activities of employees, chemical engineers and operating supervisors can do much to eliminate such waste. Such a program is called "Work Simplification" and was described by J. R. Bailey of the Industrial Engineering Div., du Pont company. With moving pictures he showed the results of such a program in which the aid of workmen was enlisted.

Friday morning, data were presented by C. R. Payne and W. W. Duecker of Atlas Mineral Products and Texas Gulf Sulphur, respectively, which showed the chemical resistance of sulphur cement. These cements are not affected by water or dilute mineral acids, or by various organic acids at low temperatures. Strong oxidizing agents, basic solutions and copper salts, however, should not be used in contact with sulphur cements. (See page 766 for details).

Henry F. Palmer, Xylos Rubber Co., Akron, Ohio, and James M. Hines, Proportioneers, Inc., Providence, R. I., presented a paper describing the mechanism and methods of operation of automatic equipment for diluting caustic and blending it with oils in the reclaiming of rubber. Continuous operation, accuracy and compactness were the important features.

"Heat Transfer in the Radiant Section of Petroleum Heaters," was the title of a paper presented by Walter E. Lobo and James E. Evans of M. W. Kellogg Co. It reviewed the empirical equations for predicting heat transfer in the combustion chambers of steam boilers and petroleum heaters. Furthermore, it analyzed data obtained in 85 performance tests on 19 furnaces of different characteristics.

Another paper that brought forth much discussion was that of Wyman P. Fiske of M.I.T. and R. W. Arentson, Carnegie-Illinois Steel Corp. It described the distribution and control of steam costs in a process plant. Because steam has a multiplicity of uses in a given plant, it is difficult to allocate the cost of such steam. Bases for distribution fall into four classes: (1) enthalpy methods; (2) available work; (3) differential costs, and (4) arbitrary methods. In any case cooperation between accountant and engineer is essential.

An interesting innovation in the theory of the unconfined distribution (where no wall effect appears) of liquid in tower packing was described by R. S. Tour, University of Cincinnati, and Frank Lerman, Blaw Knox Co., Pittsburgh, Pa. These men have applied the laws of probability to the problem and derived an equation expressing the liquid distribution as functions of the horizontal displacement from a vertical centerline. Experimental data obtained by Hurter in 1893 and further tests by the authors on a coke-packed tower 20 in. in diameter, were offered to prove the validity of the equation.

Several other papers dealing with packed towers were described at the same meeting. Two of them were presented by the same authors, T. K. Sherwood of M.I.T. and F. A. L. Holloway, of Standard Oil of Louisiana. Their first paper proposed a general program of research on gas absorption in packed towers and outlined the status of the principal problems at the present time. Data were reported on the absorption of ammonia from air in 1 in. rings and it was concluded that the liquid film offers an appreciable fraction of the total resistance to the absorption of ammonia by water. Also data were presented on vaporization of water into air in a 20-in. tower packed with 1.5 in. rings, and the result compared with other gas-film coefficients. In a like manner, the effect of wetting agents was determined. The coefficients (liquid film) for desorption of CO_2 from water were considerably reduced by the addition of wetting agent, but the evaporation of water was not affected.

The second paper presented by the above two authors reported data on desorption of carbon dioxide, oxygen and hydrogen in a 20-in. i.d. tower packed with 1.5 in. Raschig rings. It was found that for liquid rates below the range of incipient flooding the data could be correlated by the expression

$$\frac{k_L\, a}{D} = \text{constant} \times \left(\frac{L}{\mu}\right)^{0.75} \left(\frac{\mu}{\rho D}\right)^{0.47}$$

$k_L a$ = liquid-film coefficient
D = diffusion coefficient or diffusivity
L = superficial liquid rate
μ = gas visocity
ρ = gas density

Distillation in packed columns was the subject of a paper by C. C. Furnas and M. L. Taylor of Yale University. In a study made of the separation of ethyl alcohol from water in the enriching section of a packed tower 12 in. in diameter, it was found that the performance of the column was affected only slightly by the size or type of packing. But the rate of liquid flow has a very large effect. This led to the conclusion that only a small part of the surface of the packing is wetted and that this proportion increases with the liquid velocity. Concentration of alcohol also plays a major role in column performance.

Fluid flow received attention in two papers Friday afternoon. The first, a paper by Ralph W. Moulton, Union Oil Co., Los Angeles, and W. L. Beuschlein, University of Washington, was a study of the flow of air at pressures from 1 to 300 atmospheres at 30 deg. C. The increase in viscosity with an increase in pressure was greater than in previously reported results of pressures up to 200 atmospheres. Between 200 and 300 atmospheres, it increased less rapidly and appeared to be approaching a value where the viscosity was independent of pressure. Data showed that the magnitude of the factor F in Fanning's equation was independent of pressure for a particular Reynold's number over the range from 1 to 300 atmospheres. And the variation of f with Reynold's number for air follows very closely the accepted values for gases and liquids under normal pressures in smooth tubes.

J. C. Lawrence of the du Pont Company emphasized the importance of a "Philosophy of Design." He said that a philosophic attitude toward design should be acquired before the engineer enters his professional career. Mr. Lawrence does not specify all the ingredients of such a philosophy but two are outstanding—imagination and calm judgment. (See p. 776 of this issue).

The meeting closed with a paper entitled "Friction of Fluids in 'Streamline' Pipe Fittings" by Paul F. Bruins and Donald F. Othmer of Brooklyn Polytechnic Institute and Kenneth A. James, Mallinckrodt Chemical Works, Jersey City. They had investigated the friction developed by the flow of fluids in ½-in. so-called 'streamline' pipe fittings which make use of a soldered connection for minimum resistance to flow. Both water and diluted glucose solutions were used at varying velocities through all kinds of fittings and it was found that the use of streamline fittings resulted in a saving of about 20 per cent of the pressure drop as compared with screw fittings of the same size.

Resistance of Sulphur Cements

Laboratory tests, correlated with service data, show that sulphur cements are satisfactory for industrial use under many different corrosive conditions. In a later issue the authors discuss features of construction with sulphur cements.

C. R. PAYNE
and
W. W. DUECKER
Mellon Institute of Industrial Research
Pittsburgh, Pa.

FOR YEARS sulphur cements have been used as jointing compounds. Recently, due to the development of modifications of these materials, they have been applied to an increasing extent, not only as jointing materials but also in the erection of various acidproof constructions used in the chemical plant. In spite of their increasing use, no published information is available regarding their chemical resistance or specific utility. The literature regarding their use consists of general statements. Killeffer[9] says sulphur cements resist acids and alkalies. Olive[8] recommends them for use with strong acids, weak acids, hydrocarbons, water and dilute solutions. By others,[1,2,4,5,10,12,14,15,16] sulphur cements are classified as corrosion, oil and water resisting. Although these remarks may indicate in a general way the range of usefulness of such compounds they are hardly specific enough to allow the chemical engineer to determine when and where sulphur cements should be applied. Specific data exist regarding the corrosion resistance of many materials of construction. These have proved to be useful in the design of plant or equipment. In an effort to provide similar data regarding sulphur cements certain studies were undertaken.*

Obviously, there is a difference in the slow action of an acid on metal and on sulphur cements. The metal is assumed to be homogeneous, the action is uniform and the deterioration nearly proportional to the loss of weight per unit surface. Sulphur cements are physical mixtures of sulphur and an aggregate. They are not homogeneous. Hence they may be expected to behave differently in the corroding solution.

In practically all of the laboratory data presented, with a few interesting exceptions, it will be noted that the weight of the cement increased until a constant value was obtained. As will be shown by data from industrial installations, this increase in weight is not indicative of chemical change or disintegration, but due primarily to absorption. Sulphur, upon changing from a liquid to a solid, decreases in volume approximately 12 per cent. In a cement made with carefully graded and sized aggregate, that is, by controlling the voids, the shrinkage can be reduced to 4 per cent or less. The final product, the cement, will therefore consist of an aggregate of fixed volume held together with a matrix of small crystals. The voids in this matrix of crystals permit the absorption of liquids to a limited extent.

Laboratory data on the corrosion of sulphur cements cannot therefore be interpreted solely on the simple basis of loss in weight, but must also be interpreted with regard to practical service data.

It is believed that by correlating the results of laboratory corrosion tests with known service data on sulphur cement subjected to these same corrosive solutions, accurate evalua-

Below — Brick floor jointed with sulphur cement in metal finishing plant

Based on a paper by the authors presented under the title of "Chemical Resistance of Sulphur Cements" at the Providence meeting of the American Institute of Chemical Engineers, November 16, 1939. Dr. Payne is now with the Atlas Mineral Products Co. of Pennsylvania, Mertztown, Pa., and Dr. Duecker is with the Texas Gulf Sulphur Co., New York, N. Y.

* The so-called total immersion test is usually used to determine the corrosion resistance of metals and has been found to give reasonably concordant results if these are interpreted in the light of practical experience and in relationship to other variables such as abrasion, mechanical impact, flow of turbulent liquids, abrupt changes in temperature, etc. This method was used to determine the chemical resistance of sulphur cements.

The composition and other characteristics of the sulphur cement used in all experiments except that involving the use of hydrofluoric acid are given in Table I. The cement used with hydrofluoric acid was made with graded coke instead of crushed silica. The composition of the solutions tested is given in the appropriate graphs. The test sample of sulphur cement weighed approximately 150 grams and was cast in the form of a standard figure-eight briquet. The procedure of testing the cement consisted of bringing the corroding solution (500 cc.) to the proper temperature and suspending in it six specimens of sulphur cement eight days old. At stated intervals the specimens were removed, washed with a stream of water, dried with a towel and weighed. Date regarding the change in weight of the cement are given in Figs. 1, 2, 3, 4, 5 and 6. The tensile strength of the cement was determined at the beginning and at the end of the test. These data are shown in Fig. 7.

The water absorption and apparent porosity of the cement were determined according to the method recommended by A.S.T.M.[3] The test specimen instead of being dried at the temperatures recommended was dried at 70 deg. C. Instead of suspending the specimen for two hours in boiling water, it was suspended for this length of time in water at 90 deg. C.

tions can be made of the utility of sulphur cements in various corrosive solutions.

Effect of Water—It is shown, Fig. 1, that sulphur cement absorbs water at a constant rate until a maximum of approximately 1 per cent has been absorbed after 230 days of immersion at 70 deg. C. The absorption as determined by the A.S.T.M. method is equivalent to that obtained at 70 deg. C. in about 100 days. Although the water, in which the cement was suspended, attained a pH of 5.1 in five months, there was no indication that water deteriorates sulphur cement. This conclusion is supported by the following service data.

Sulphur cement is used as a lining in the construction of tanks subjected to both hot and cold water. Such tanks are used for washing steel strip after it emerges from acid pickling or neutralization baths. Some of these tanks have been in service for eight years and inspection of the sulphur cement joints in these linings shows that the cement joints have not deteriorated even in the hot water wash tanks which are operated at approximately 90 deg. C.

Sulphur cement joints in floors, particularly dairy floors, are constantly washed with hot and cold water. One dairy floor in a milk bottling room, inspected after four years of service, showed no evidence of disintegration in the sulphur cement joints. Favorable reports have been obtained from similar installations.

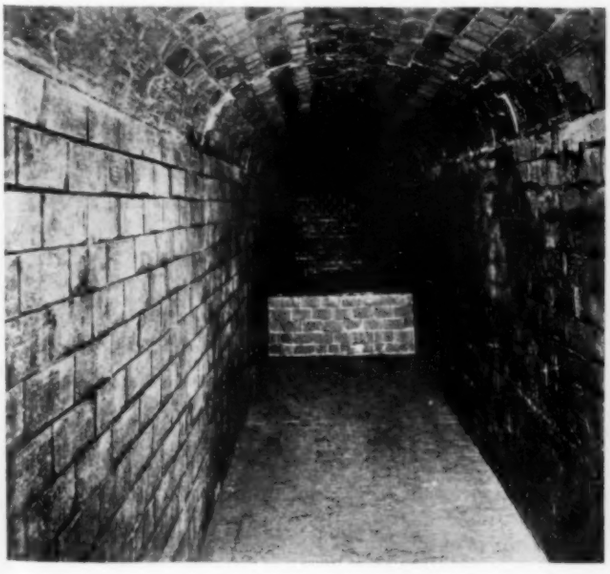
Sulphur cement joints are commonly used for jointing cast iron water mains. Performance data of sulphur cement joints in cast iron pipe over a period of 25 years have been given by Schmitt[12]. His data show that at the end of this period, sulphur cement joints were superior to lead joints in resistance to vibration and the joints were water tight and unaffected. In large scale tests it was found that sulphur cement joints withstand pressures greater than those normally possible in a water works system. Prior[10] found that the strength of sulphur cement joints in cast iron pipe was represented by $P + 40 = 3{,}800/(D + 6)$, where D is the nominal diameter of the pipe in inches and P the pressure of the contained liquid in pounds per square inch.

In this connection it is interesting to note the change in tensile strength of sulphur cement with time and after being submerged in water at 70 deg. C. for two years. Initially, as shown in Fig. 7, the cement has a tensile strength of 650 lb. per sq. in. After being buried in moist soil its strength increased to 750 lb. per sq. in., and then after two years, attained a constant value of 560 lb. per sq. in. In water at 70 deg. C. for two years, no doubt the strength of the cement undergoes similar changes but perhaps more rapidly. Other evidence leads us to believe that the tensile strength of 440 lb. per sq. in. attained after two years at 70 deg. C. is probably a constant value. This opinion is substantiated by practical experience.

Effect of Hydrochloric Acid—The laboratory results obtained with various concentrations of hydrochloric acid, as shown in Fig. 1, with few exceptions were similar to those obtained in water. These data seem to indicate that hydrochloric acid, particularly of 8, 15 and 25 per cent concentration, has no deteriorating effect upon sulphur cement at temperatures up to 70 deg. C. Even after eight months in acid of these concentrations at 70 deg. C., the strength of the cement was more than that of a cement immersed in water at the same temperature for more than two years.

Sulphur cement linings subjected to hydrochloric acid have been in use in various types of industrial equipment for a number of years. Service data on several representative installations are here noted. Tanks lined with sulphur cement are used for holding 10 to 25 per cent hydrochloric acid solutions at temperatures up to 98 deg. C. The largest tank inspected measured approximately 40 x 8 x 6 ft. and is used for the continuous pickling of wire. These tanks which have been in constant service over a period of six years show no apparent disintegration of the sulphur cement. Tanks lined with sulphur cement and holding 15 per cent hydrochloric acid are used for cleaning of steel prior to galvanizing. The operating temperature is 90 deg. C. and

Neutralization pit and sewer for pickling and plating wastes; concrete lined with sulphur-cement jointed brick



Concrete tank lined with carbon brick and jointed with sulphur cement to hold pickling liquor for stainless steel

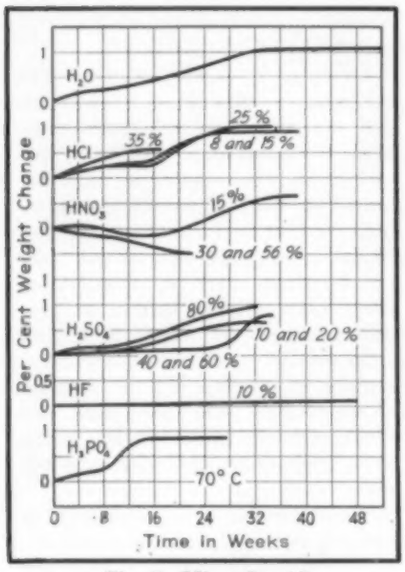


Fig. 1—Mineral acids

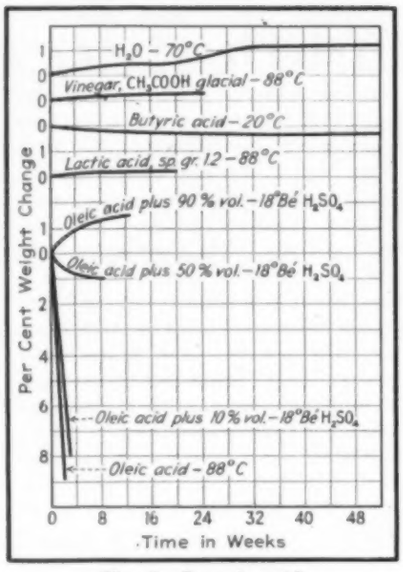

Per Cent Weight Change
Time in Weeks
H2O - 70°C
Vinegar, CH3COOH glacial - 88°C
Butyric acid - 20°C
Lactic acid, sp. gr. 1.2 - 88°C
Oleic acid plus 90 % vol. - 18° Bé H2SO4
Oleic acid plus 50 % vol. - 18° Bé H2SO4
Oleic acid plus 10 % vol. - 18° Bé H2SO4
Oleic acid - 88°C

Fig. 2—Organic acids

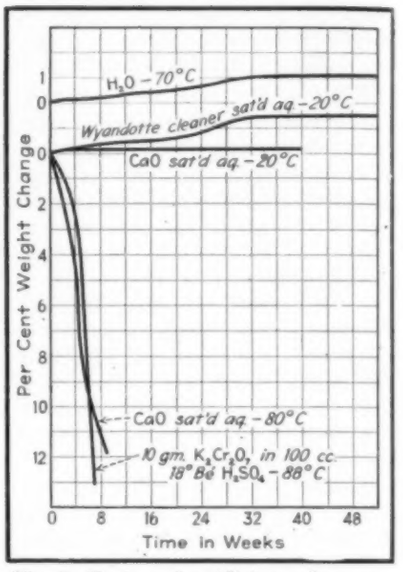

Per Cent Weight Change
Time in Weeks
H2O - 70°C
Wyandotte cleaner sat'd aq. - 20°C
CaO sat'd aq. - 20°C
CaO sat'd aq. - 80°C
10 gm. K2Cr2O7 in 100 cc. 18° Bé H2SO4 - 88°C

Fig. 3—Basic and oxidizing substances

Charts of results of total immersion tests showing average per cent weight changes of 150-gm. sulphur cement briquets after

the cement is in good condition at the end of five years of service. Tanks for the storage of commercial hydrochloric acid are also made with the aid of sulphur cement. Inspection of the joints in several tanks used for this service showed that these had not disintegrated after two years.

Effect of Nitric Acid—In the laboratory tests as shown in Fig. 1, little change could be detected in the sulphur cement sample immersed in 15 per cent nitric acid during the first part of the test. After 60 days, however, a decrease in weight was noted and after 184 days the sample showed a slight increase in weight. The corrosion of sulphur cement by 56.52 per cent acid is approximately the same as for the 30.49 per cent solution. All of the samples also decreased in tensile strength as shown in Fig. 7. The strength of the cement immersed in 15 per cent nitric acid, however, compared favorably with that of the cement immersed in water, while that of the cement subjected to 30.49 per cent acid is still sufficient for all general purposes.

The service data obtained show that the slight loss in weight observed in the laboratory tests may not always be of sufficient magnitude to prohibit the use of sulphur cement in contact with the normal concentrations of nitric acid at temperatures up to 65 deg. C. Inspection was made of a tank lined with sulphur cement which had been in service for five years. It held a solution consisting of 15 per cent nitric and 5 per cent hydrofluoric acids at 60 to 65 deg. C. and was used for the pickling of stainless steel. The sulphur cement joints have not receded from the face of the carbon brick and there is no evidence of disintegration. A large number of tanks have been constructed for this same service and have been in use for from one to three years. The largest tank in this type of service measured approximately 40 x 7 x 6 ft.

Another tank was inspected which had been in service for eighteen months and used during that period for holding a 28 per cent nitric acid solution at temperatures up to 65 deg. C. The sulphur cement was not disintegrated. This tank is used for the pickling of various alloys.

Several other tanks were inspected which have been in service for approximately two years. These were used to hold a mixture consisting of 40 per cent nitric acid and 20 per cent hydrofluoric acid at temperatures up to 55 deg. C. These tanks are used for the pickling and cleaning of aluminum and the sulphur cement joints showed no deterioration.

Effect of Sulphuric Acid—The results obtained from the laboratory tests on the resistance of sulphur cements to various concentrations of sulphuric acid are, as shown in Fig. 1, fairly consistent. At the end of 230 days, absorption from all concentrations tested, with one exception, was normal as compared to water. Absorption from an 80 per cent solution at the end of 230 days seems to be abnormally high.

These data, as well as those presented in Fig. 7 substantiated by years of practical experience, indicate that sulphur cement is resistant to all concentrations up to 62 per cent sulphuric acid, and may be used in contact with more concentrated acid at low temperatures. Sulphur cement is being used successfully for the construction of many types of industrial equipment subjected to sulphuric acid, and may be used in contact with more concentrated acid at low temperatures.

In the steel industry, practically all of the large tanks used for the pickling of wide strip steel are protected with acid-proof linings constructed of brick jointed with sulphur cement. The continuous pickling units containing from 8 to 15 per cent sulphuric acid are approximately 300 ft. long, five feet deep and vary in width from three to eight ft. It is estimated that

Table I—Characteristics of Sulphur Cement*

Tensile strength, lb. per sq. in.	650
Compressive strength, lb. per sq. in.	6,300
Adhesion to wire-cut brick, lb. per sq. in.	450
Coefficient of expansion (deg. F.)	8.3×10^{-6}
Coefficient of expansion of brick jointed with sulphur cement (deg. F.)	4.3×10^{-6}
Absorption (A.S.T.M.)	0.52
Apparent porosity (A.S.T.M.)	0.97
Thermal conductivity, Bt.u. per hour, sq. ft., deg. F., and ft. of thickness (at 21 deg. C.)	0.14 to 0.16

* Composition by weight: Sulphur, 58.8; olefine polysulphide, 1.2; crushed silica, graded, 39.8; carbon black, 1.0 per cent.

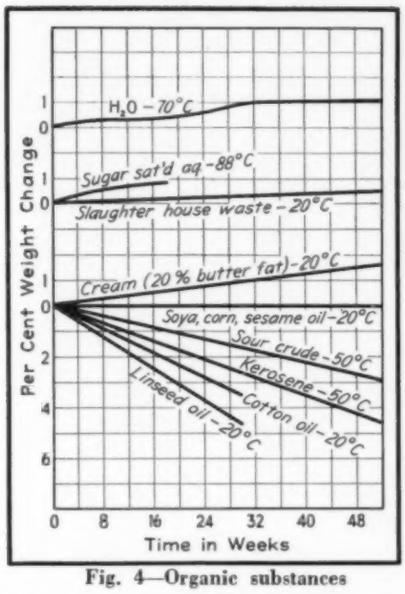


Fig. 4—Organic substances

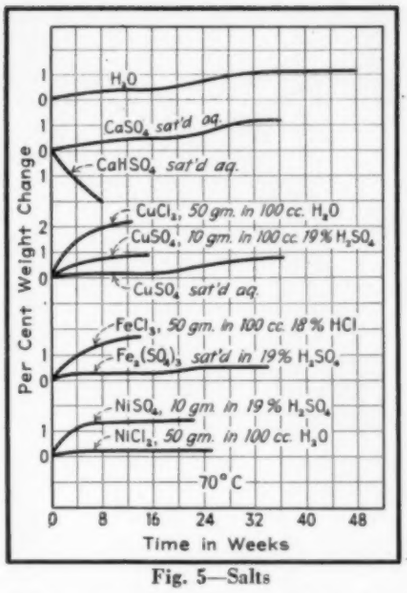

Per Cent Weight Change
H₂O
CaSO₄ sat'd aq.
CaHSO₄ sat'd aq.
CuCl₂, 50 gm. in 100 cc. H₂O
CuSO₄, 10 gm. in 100 cc. 19% H₂SO₄
CuSO₄ sat'd aq.
FeCl₃, 50 gm. in 100 cc. 18% HCl
Fe₂(SO₄)₃ sat'd in 19% H₂SO₄
NiSO₄, 10 gm. in 19% H₂SO₄
NiCl₂, 50 gm. in 100 cc. H₂O
70° C
0 8 16 24 32 40 48
Time in Weeks

Fig. 5—Salts

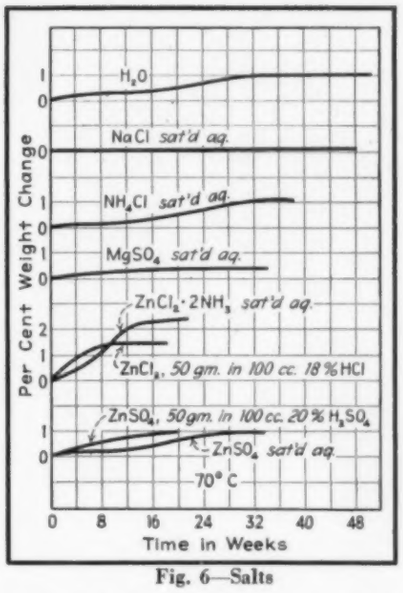

Per Cent Weight Change
H₂O
NaCl sat'd aq.
NH₄Cl sat'd aq.
MgSO₄ sat'd aq.
ZnCl₂·2NH₃ sat'd aq.
ZnCl₂, 50 gm. in 100 cc. 18% HCl
ZnSO₄, 50 gm. in 100 cc. 20% H₂SO₄
ZnSO₄ sat'd aq.
70° C
0 8 16 24 32 40 48
Time in Weeks

Fig. 6—Salts

immersion in various solutions and reagents; the curve for water at 70 deg. C. is given on each chart to permit comparison

over 40 of these units are now in service. The first of these tanks for the continuous pickling of steel strip was placed in service about six years ago and the cement used in its construction is still in excellent condition. The only evidence of wear is at one portion of the floor of the tank over which the steel strip was allowed to drag. Part of the brick lining of this section of the floor will need to be replaced. Since the construction of these tanks, skid blocks have been designed which are cemented directly into the sulphur cement lining and thus prevent excessive abrasion on the lining. The acid bath is operated at 80 to 90 deg. C. and it is estimated that approximately one million tons of steel strip have been pickled in these tanks. Numerous other tanks constructed with the aid of sulphur cement such as batch pickling tanks, tanks for the pickling of billets and rods using various types of mechanical devices, have been in service for periods up to ten years. Tanks, floors, and sewers used for the collection, neutralization and disposal of the waste pickling solution are usually lined with sulphur cement joined brickwork.

Recently a tank was inspected which was used for the storage of 50 per cent sulphuric acid at 65 deg. C. The sulphur cement lining was in good condition at the end of a year.

Large areas of floors jointed with sulphur cement have been constructed in chemical plants, plating rooms, plants for the electrolytic refining of metals, as well as in steel mills. These floors are subjected to various concentrations of sulphuric acid and metal sulphates. A number of these floors which have been in service for periods up to five years were inspected. They show no chemical disintegration and a remarkable resistance to mechanical punishment.

A sewer for the disposal of acid mine waters was constructed of concrete and lined with vitrified liner plates jointed with sulphur cement. At the time of inspection the sewer had been in constant use for sixteen months and the sulphur cement was in good condition. This observation checks with those reported by Leitch.[7]

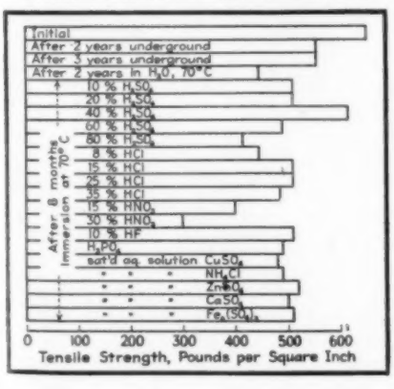
Effect of Phosphoric Acid—Sulphur cement increases in weight by 0.82 per cent when immersed in 50 per cent phosphoric acid for 120 days at 70 deg. C. This absorption is about the same as that of sulphur cement in water. The samples showed no evidence of disintegration, neither did they suffer much loss in tensile strength.

Inspection of a tank which has been in service for about two years, and used to hold a 5 per cent solution of phosphoric acid at 90 deg. C., showed that the sulphur cement lining was unaffected. This tank is used for the pickling and finishing of steel bridge sections and measures 40 x 7 x 11 ft.

Effect of Hydrofluoric Acid—Laboratory tests show that the absorption of 10 per cent hydrofluoric acid by a sulphur cement which had been compounded with an aggregate consisting entirely of carbon, was negligible. These data substantiate the service data previously cited in the discussion of resistance of sulphur cement to nitric acid and mixtures of nitric acid and hydrofluoric acid.

Effect of Organic Acids—All organic acids at room temperature and lactic and acetic acids even at 88 deg. C., as shown in Fig. 2, have little effect upon sulphur cements. At the higher temperature, however, oleic acid has a decided effect and at the end of 30 days caused a loss of 20 per cent in weight which is about equivalent to that caused by chromic acid. The addition of sulphuric acid to oleic acid decreases the rate of corrosion, the loss being 14 per cent after the addition of 10 per cent acid, 0.8 per cent on the addition of 50 per cent

Fig. 7—Comparative strengths of cements before and after immersion



acid, and ceasing entirely upon the addition of 90 per cent acid.

In practice it has been found that floors jointed with sulphur cement, and subjected to the attack of various concentrations of lactic and acetic acids, show no disintegration at the end of two years of service. Tanks for holding a mixture of palm oil and sulphuric acid show no disintegration at the end of three years of service. No service data are available on oleic acid but it is evident from the laboratory data that sulphur cement should not be used in contact with this acid at high temperatures unless a considerable percentage of sulphuric acid is present.

Effect Alkaline Solutions — Lime and a saturated solution of an alkaline cleaner commonly used in dairies, as shown in Fig. 3, have little or no effect on sulphur cement at room temperature. At 80 deg. C., however, a saturated lime solution in 60 days caused a loss in weight of 12 per cent. This indicates that sulphur cement cannot be used in contact with the lime solutions at these elevated temperatures. Although sulphur cement shows little resistance to strong bases, it is nevertheless giving successful service as jointing material for floors, sewers, trenches, etc., which are subjected intermittently to dilute caustic solutions.

A large number of tanks containing sulphur cement linings are being used for the neutralization and disposal of acid wastes. The wastes treated include those obtained from pickling operations, from plating baths, from rayon plants, from petroleum refineries, and wastes from pigment plants. While the solutions in these tanks occasionally become alkaline for short periods, the sulphur cement joints are not disintegrated.

Effect of Oxidizing Solutions—Strong oxidizing agents, such as a solution of 10 per cent potassium dichromate in 18 deg. Bé sulphuric acid, have a decided disintegrating effect upon sulphur cement. In the laboratory test, as shown in Fig. 3, the sulphur cement sample lost 19.43 per cent of its weight in 60 days at 88 deg. C. Obviously, sulphur cement will not be satisfactory for this service.

Service data are available to substantiate the laboratory results. A tank containing a sulphur cement lining was originally constructed to hold sulphuric acid for the pickling of steel. After the tank was constructed, the operating department decided to use chromic acid in it. The lining was badly disintegrated at the end of four weeks.

Effect of Organic Substances—Organic substances may affect sulphur cements because of their solvent action. Sugar, cream, slaughter waste, sesame, corn, and soya bean oil, at room temperature, as shown in Fig. 4, have little effect on sulphur cement. Kerosene, and sour crude oil caused a loss of 4.6 and 2.9 per cent respectively in one year at 50 deg. C. Cotton and linseed oil at 20 deg. C. caused a loss of 3.5 and 4.6 per cent respectively. These latter oils were also thickened and livered, due to reaction with sulphur.

Industrial experience with floors jointed with sulphur cements in dairies, slaughter houses, and food packing plants shows them in good condition at the end of three to four years of service. No service data are available on cottonseed or linseed oil but the laboratory tests indicate that sulphur cement should not be used in constant contact with these substances. Floors in sugar refineries show no disintegration after fourteen months of service.

Effect of Various Salts—Laboratory tests, Figs. 5 and 6, indicate that calcium sulphate, copper sulphate, copper chloride, ferrous sulphate, ferric chloride, nickel sulphate, sodium chloride, magnesium sulphate, zinc chloride, and zinc sulphate have no serious effect on sulphur cement. Calcium bisulphite dissolves sulphur, causing a loss of 0.7 per cent in 15 days. These results are substantiated by industrial service data.

The excellent results obtained with tanks lined with sulphur cement in the pickling of steel indicate that iron sulphates have no effect on sulphur cement. Tanks subjected to somewhat similar salts have also been in service for more than three years in the production of pigments.

Tanks for the storage of a 20 per cent copper sulphate and 20 per cent sulphuric acid solution show no deterioration of the sulphur cement jointing compound after three years of service.

Sulphur cement linings, however, proved unsatisfactory in tanks used for the electrolytic refining of copper by the series system, owing to the fact that copper sulphide was formed at the cathode end as the result of electrolytic action.

Previously, mention was made of the use of tanks lined with sulphur cement in the pickling of steel with hydrochloric acid. Such service has demonstrated the resistance of these cements to ferric chloride. Similar tanks, used for the storage and dilution of ferric chloride in water treating plants, inspected after two years of service, were found to be in excellent condition.

Electrolytic cells lined with sulphur cement and containing an electrolyte consisting of 350 grams of sulphuric acid and 250 grams of zinc sulphate per liter have been in service for more than three years without maintenance cost. In the metallurgical industry, leaching tanks, recirculation pits, floors, piers, trenches and sewers, made of acidproof brick jointed with sulphur cement have been used with excellent success.

In the production of zinc pigments, tanks used for the dissolving of zinc have also been in service for three years.

Floors subjected to ammonium sulphate solutions in byproduct coke plants have been in service for over one year and show no signs of disintegration.

Tanks previously described are used successfully for the neutralization of sulphuric acid with lime, demonstrating resistance to calcium sulphate.

While service data are not available from industry for the handling of the salts of nickel and magnesium, there seems little doubt but that these salts as well as many others will be without effect on sulphur cement.

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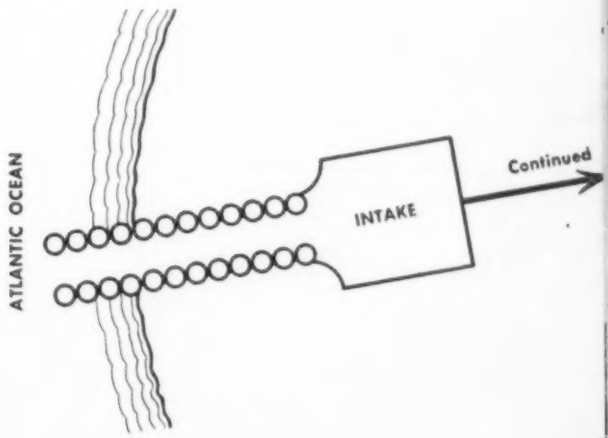
Bromine From Sea Water

TO MAKE a commercially practicable anti-knock fluid for gasoline with tetraethyl lead, it was found that another ingredient ethylene dibromide was needed to mix with the tetraethyl lead, and needed in large quantities, if any substantial proportion of the nation's automobiles were to have the benefit of high-compression engines and the improved gasoline such engines require.

To meet this demand for bromine the forces of the Dow Chemical Co. and the Ethyl Gasoline Co. formed a partnership known as the Ethyl-Dow Chemical Co. which adapted the blowing-out process for extraction of bromine from brine which had been in use for some years to the extraction of bromine from sea water. A plant was built on a peninsula a little above the mouth of the Cape Fear River near Wilmington, N. C. At first 15,000 lb. of bromine were recovered per day but with additional units and improvements in processes the plant now has a capacity of 60,000 lb. per day.

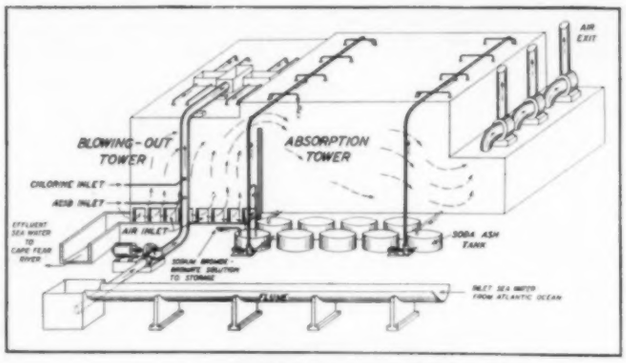
Bromine is present in sea water to the extent of 67 parts per million. In order to extract it the water is first passed through rotary screens to remove fish and debris. Sulphuric acid and chlorine are then added to the water which is pumped to the top of blowing-out towers. The mixture is distributed within the towers and the bromine vapor is blown out by a counter-current of air to chambers in the absorption towers. There the bromine is reacted with a soda ash solution to produce sodium bromide-bromate. The mixture is treated with sulphuric acid producing free, concentrated bromine. This is collected as liquid bromine in columns. It reacts with ethylene gas in reactors to form ethylene dibromide. This process is shown in the accompanying flow sheets. Many steps in the process are illustrated by photographs.

The plant of the Ethyl-Dow Chemical Co. was located on a peninsula a little above the mouth of the Cape Fear River near Wilmington, N. C. The capacity of the plant has grown from a daily output of 15,000 lb. of bromine to 60,000 lb.

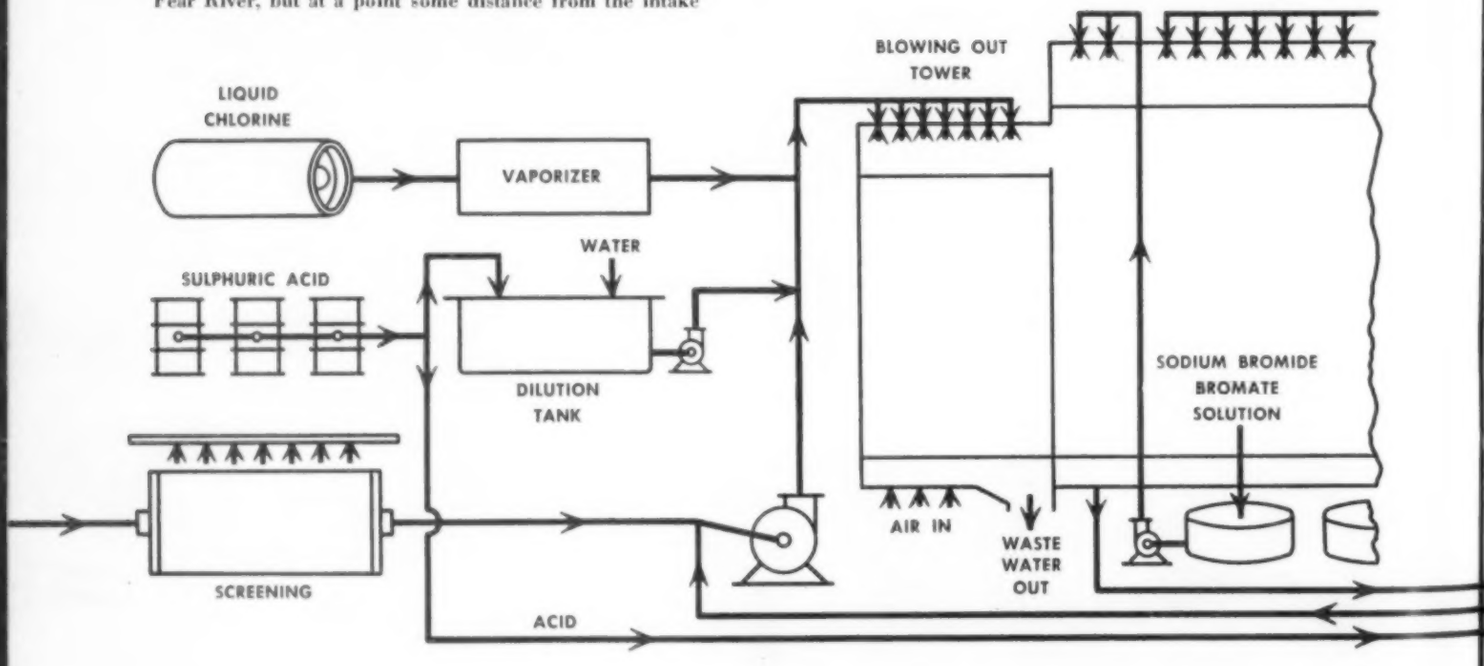


The plant is now treating 137,000 gal. of sea water per minute. The sea water is pounding through an intake from the Atlantic Ocean to a settling basin

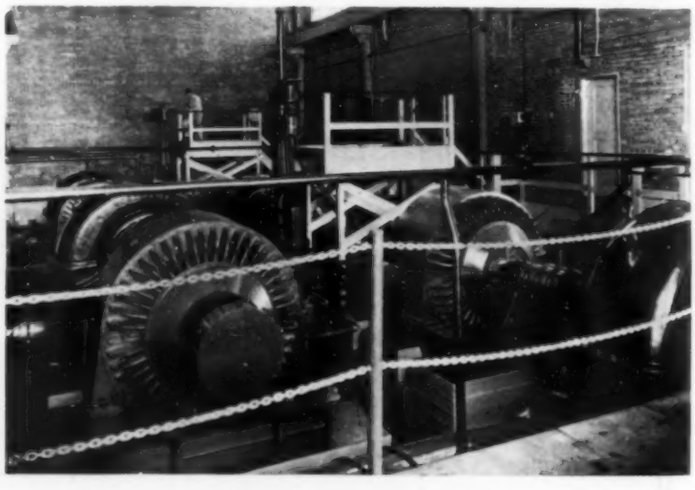
Effluent from the blowing-out tower, bromine-free sea water, still containing other elements, flows to the Cape Fear River, but at a point some distance from the intake



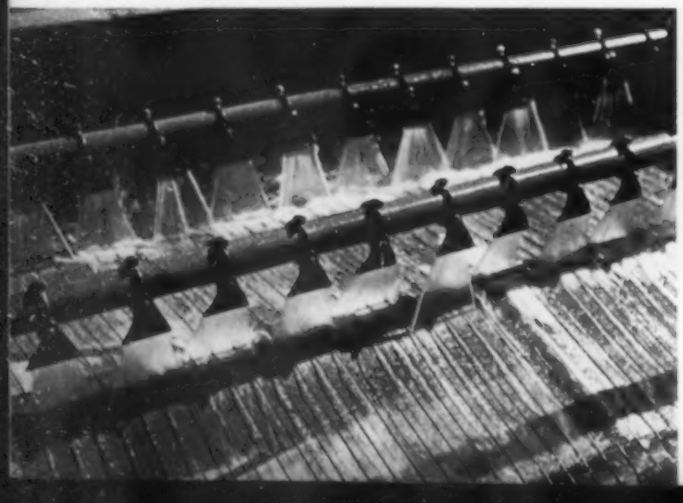
Acid and chlorine are added to the sea water on its way to the top of the blowing-out tower. The mixture is distributed within the tower and the bromine vapor is blown out by a counter-current of air to chambers in the absorption tower

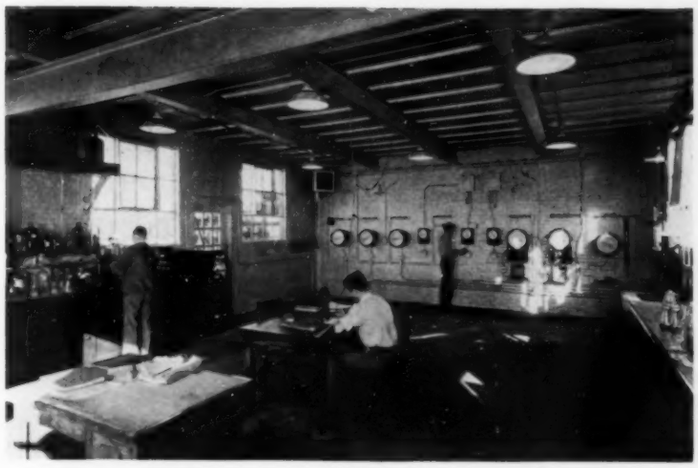


These powerful pumps lift the water. They have a total capacity of 137,000 gal. per minute

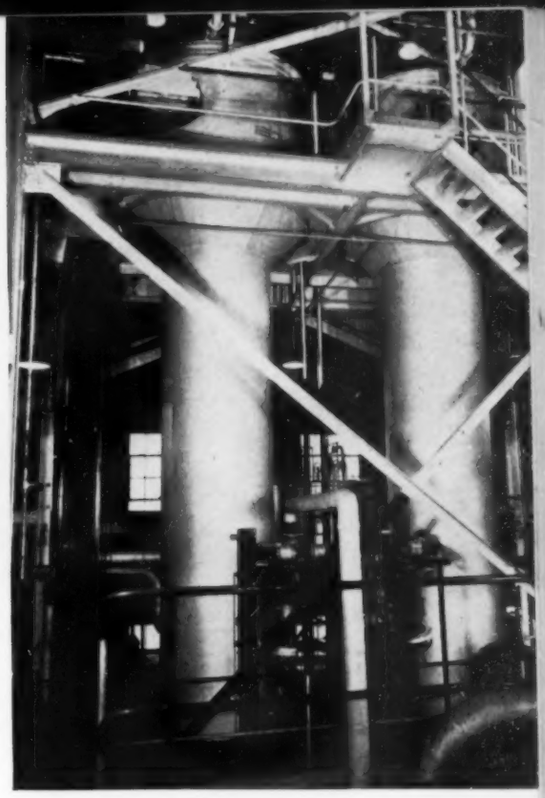


Sea water flows 4,000 ft. across the peninsula before reaching rotary screens which turn aside fish and debris. Water then passes to extraction units

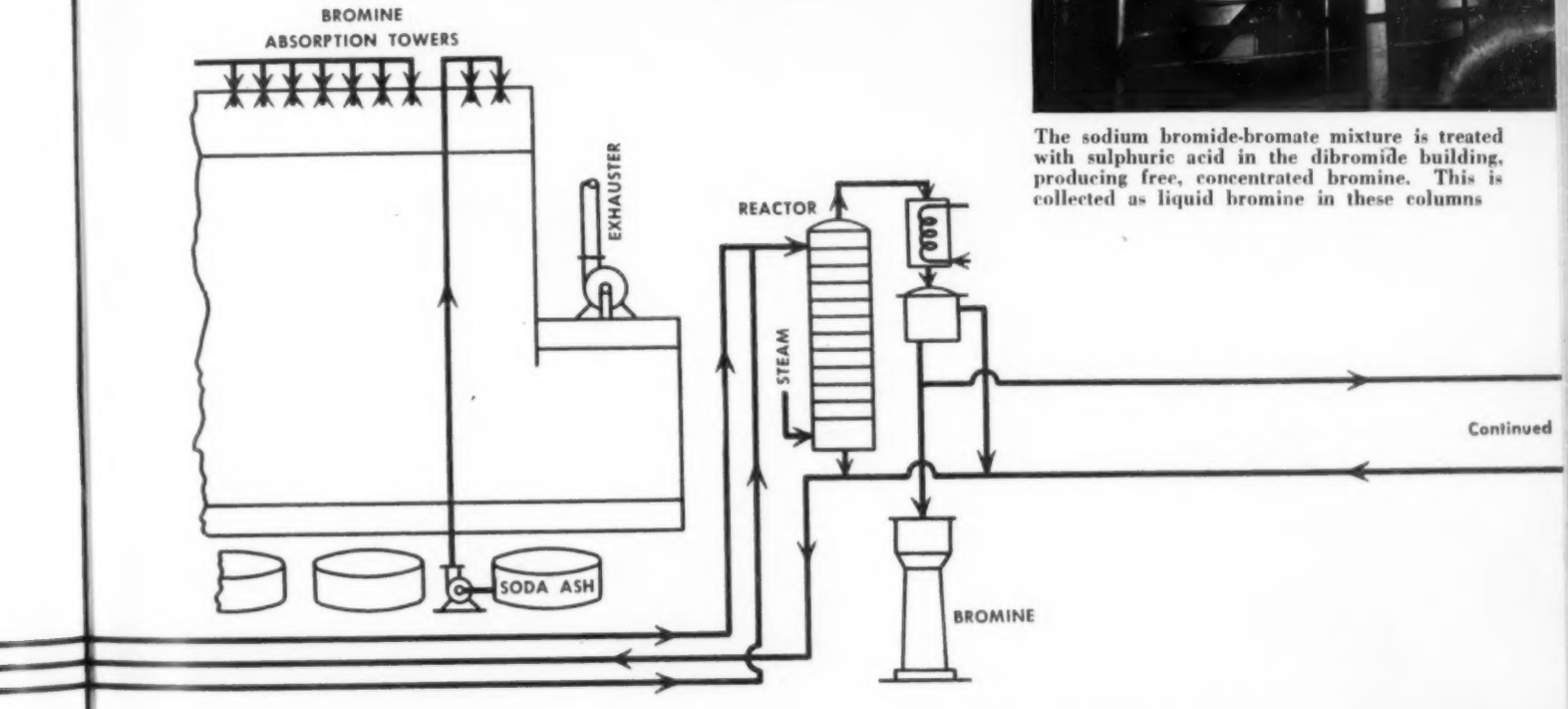




Success of the process depends on accurate control of amount and quality of chemicals used



The sodium bromide-bromate mixture is treated with sulphuric acid in the dibromide building, producing free, concentrated bromine. This is collected as liquid bromine in these columns



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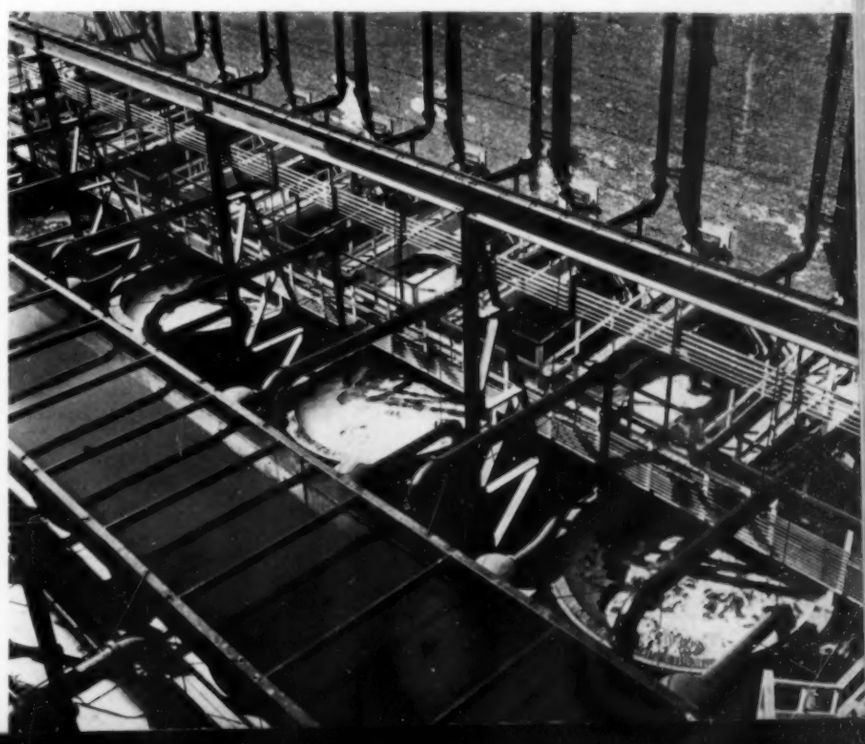
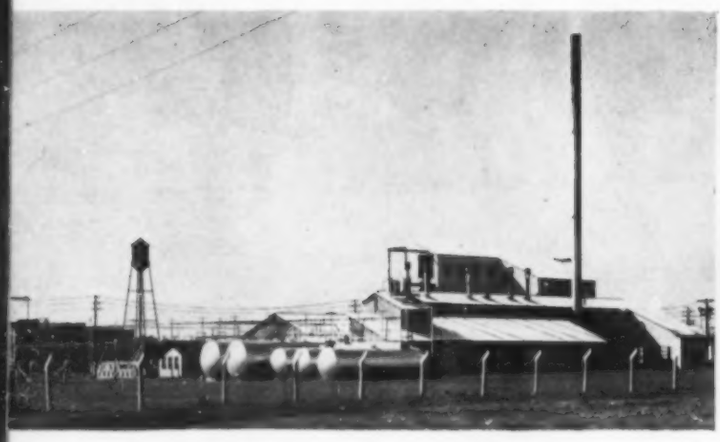
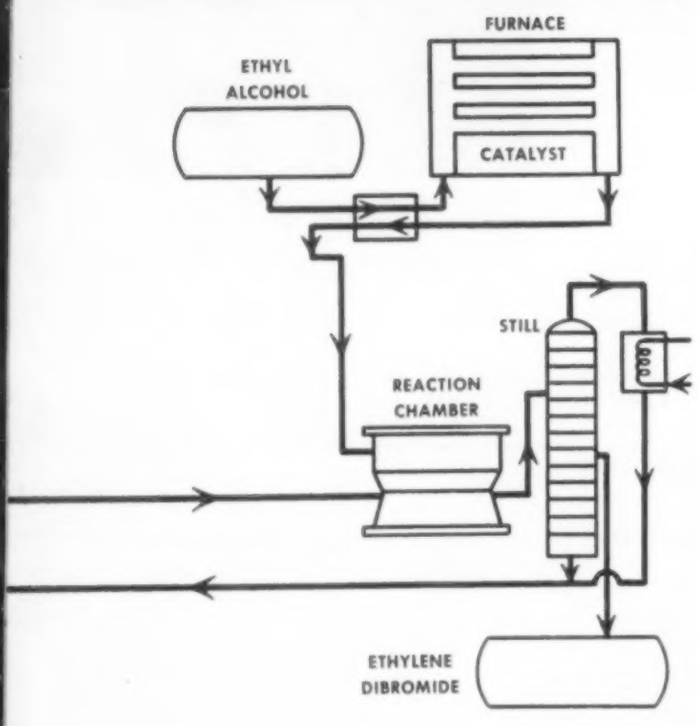
In the absorption towers, bromine is reacted with a soda ash solution to produce sodium bromide-bromate



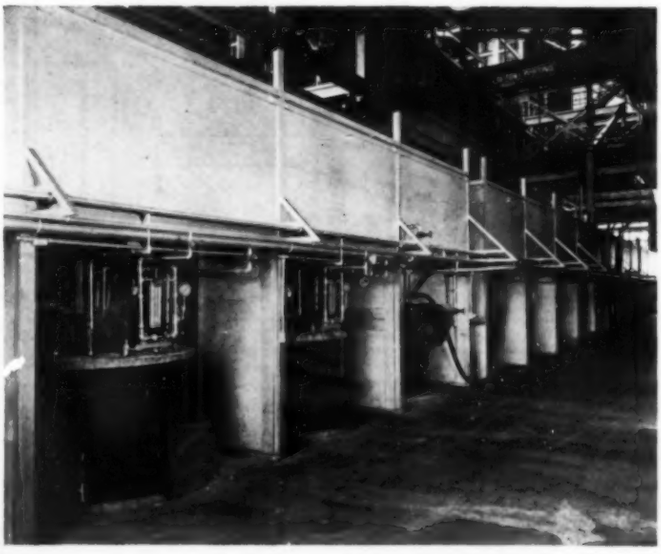
A Chem & Met PICTURED FLOW SHEET



The ethyl alcohol is broken down to ethylene gas by these low, coke-fired, catalyst-containing furnaces



Above left—Ethyl alcohol is broken down by heat in this building. The ethylene gas is used to combine with the bromine



A view in the reactor room of the building shown in the upper left-hand corner. Ethylene gas reacts with bromine to give ethylene dibromide

Another view in the above building. Cooled by these complex condensers, the necessary ethylene gas is obtained

Keeping Goods Dry In Transit

Sealed containers have been found to offer inadequate protection to goods which may be damaged by moisture. The use of silica gel is proposed to furnish the dehydration which is needed in addition to accepted packaging and sealing methods

R. L. HOCKLEY
The Davison Chemical Corp.
Baltimore, Md.

MOISTURE damage to goods in transit is often very large. Precautions commonly taken to prevent water from getting at the goods during shipment are rarely adequate. It is not enough to wrap such goods tightly. Even the hermetical sealing of containers does not always suffice, and sometimes even makes bad matters worse.

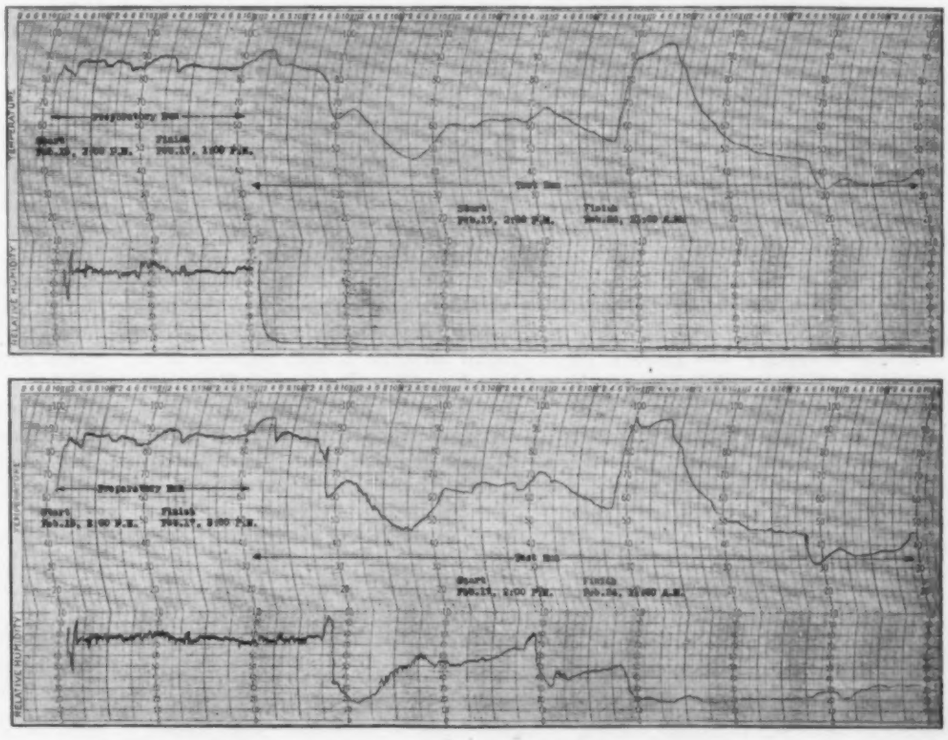
An extended study has been made by The Davison Chemical Corporation of this subject. A number of little understood but extremely important factors have been investigated. The results clearly indicate that actual direct drying of the atmosphere inside of packages is frequently the only way to accomplish protection of goods which can be damaged by rust, mildew and mold, or other moisture-caused damage.

Corrosive action on most materials occurs not only in the presence of liquid water but in the presence of relatively moist air as well. Generally an atmosphere must be maintained below 40 per cent relative humidity, preferably as low as 30 per cent, to protect against corrosion of iron and steel and the formation of mildew, mold, and other moisture damage.

It is not sufficient to have the atmosphere inside a tight container dried within these normally safe limits at the outset of shipment. If such a container cools down during transport, the resulting interior condition may be serious, even when the initial atmosphere seemed dry enough. Consider a container packed at 70 deg. F. and 30 per cent relative humidity: if cooled to 50 deg. F., the relative humidity increases to 63 per cent; and if further chilled to 37 deg. F. or cooler, the original air of 30 per cent humidity becomes completely saturated, and water vapor begins to condense on the surfaces of packed objects.

Many containers for goods that can be damaged readily by water contain parts or packing materials which are virtually water carriers. Paper, many types of loose packing material, and even the wooden cleats or blocks inside a packing case, contain moisture in amounts varying according to the conditions to which they have been exposed before use. In nearly all cases

Temperature-humidity conditions inside test boxes simulating shipping containers, the upper chart showing Protek-Sorb results; the lower, conditions in box not so protected



such packing materials carry into a container so much water that after it is closed the humidity of the atmosphere rises above the safe 30 per cent humidity limit. Thus, without a suitable drying agent, even if the container were made wholly impervious to moisture vapor or were sealed hermetically, it is not at all certain that the goods inside will be free from moisture damage.

Tests and Results

The investigations which have been made have utilized a form of silica gel which is now marketed under the trade name Protek-Sorb. The material, with its remarkable capacity for adsorption, is neither deliquescent nor corrosive. Its action is physical rather than chemical and it is therefore ideally suited to this application. Normally, the gel is prepared in small muslin bags of sizes suitable for various sorts of closed containers. The quantity of gel used depends both on the size of the package to be protected and the extent of moisture vapor exposure anticipated. The gel absorbs up to 45 per cent of its own weight of water from saturated atmospheres. Thus but a small quantity is required to effect and maintain a 30 per cent relative humidity in well made containers.

Samples of this material have been utilized under various test conditions in the laboratory to determine the degree of protection against moisture damage to polished steel surfaces. A reproduction of two charts showing comparative conditions between containers packed with and without Protek-Sorb is given herewith. Other studies have been made in sample containers exposed outdoors for considerable periods of time. The results obtained showed that:

1. Activated silica gel will rapidly reduce the moisture content in sealed packages.

2. The necessary low relative humidity inside such packages can be so maintained over considerable periods even when the packing materials give off moisture slowly, or when moisture ingress takes place because the container is not perfectly tight against water vapor.

3. Moisture damage to steel surfaces in sealed containers will not occur when relative humidities are maintained in the neighborhood of 30 per cent, at atmospheric temperatures encountered during shipment.

4. Most packing materials normally considered watertight are not tight against water vapor. The moisture penetrates through such wrapping materials by diffusion through the substance itself, often by apparently dissolving in the wrapping material on the outside, and evaporating inside the container.

5. Hermetically sealed containers, due to temperature changes anticipated during shipment, require protection against the moisture contained in them at the time of closure, including both the moisture in the air and the moisture in the packing materials, or sometimes in parts of the commodity itself.

6. It is difficult to get a package tight against moisture vapor even if it appears normally waterproof. Hence protection by dehydration is needed in addition to the use of the best available sealing methods.

Application of the material has been used with success in the shipment of articles ranging from business machines to automobiles, printing presses and even the largest transport airplanes. On the basis of its experimental results, and after numerous successful commercial trials, the company has begun marketing silica gel for this shipping use. Since the quantity required in most packages is small, the cost is nominal, often being much less than the cost otherwise required for relatively ineffective methods of moisture proofing.

Philosophy of Design

Wherein a well-known expert on fluids flow and other unit operations of chemical engineering, draws on his long experience to point some principles of interest to both older and newer members of the profession.

J. C. LAWRENCE

Organic Chemicals Department
E. I. duPont de Nemours & Co., Inc.
Wilmington, Del.

IN PREPARING a paper on chemical engineering design, I am reminded of the fact that most of the literature on this subject deals with specific questions of design and the detailed problems involved therein. On the other hand, in many individual conversations with members of the profession, both young and old, I have found an even greater interest in a broad and perhaps more philosophic discussion of this important field of chemical engineering activity. A designing engineer, either intentionally or inadvertently, must acquire a "Design Philosophy" or he very soon becomes something else than a design man.

Philosophy, broadly speaking, is the love of wisdom. Basically, it may be called the knowledge of general principles—the elements or causes and laws governing facts and experiences. Again, it may mean that calm judgment and equable temper resulting from a study of basic laws and principles, causes and effects. Or it may mean fortitude in enduring suffering and reverses—and what design man worthy of the name has not at times agreed with that definition? But while the term "philosophy" may carry any or all of these meanings in connection with chemical engineering design, it is my feeling that as we must apply it, it has come to embody something more; viz., that mental or moral attitude that arrives at conclusions based on properly visualized assumptions, as well as facts of observation, both of which must be thoroughly homogenized by such contingent knowledge as has been gained from experience.

The writer has "sat at the feet of

Based on a paper presented at the Providence, R. I., meeting of the American Institute of Chemical Engineers, Nov. 16, 1939.

the gods" at many meetings of chemical engineers and has heard, and has often talked with industrial executives who, to paraphrase the words of the mad king, would literally "offer their kingdom for a designer." Back of that wish there must have been some qualitative as well as quantitative thinking about the qualifications needed for chemical engineering designers. Are we not generally prone to feel that there can be only two types from which to choose? On the one hand those who follow the mental labyrinth of our well-known illustrator of devious paths, Mr. Goldberg; and on the other hand, those whose maximum cerebral contribution consists in their dogged determination to prove that the straightest line is the shortest distance between two points? That may be a somewhat distorted picture of our thoughts of a design man but there are certainly many practitioners of chemical engineering design who fit one or the other of the above qualifications. These men may be well fitted technically and they may have all the textual and fundamental information that can be drilled into them in four or five years of chemical engineering education; but without that certain philosophy, that calm judgment and mental attitude which permits their thinking to arrive safely at its destination, they are not design men. Good chemical engineers—yes, but possibly round pegs in square holes; that it behooves you to remove, to their and to your own eventual advantage.

Appraisal of Facts

Let us be more specific for a time in looking into this so-called philosophy of design. Generalities are good things from which to weave sermons, but poor diets for hard-boiled and hungry chemical engineers.

Having endowed himself with that mental attitude which embodies our design philosophy, the design man must put it to work. Most chemical engineering design problems, be they to cover the design of a complete manufacturing plant or only a single piece of operating equipment, are presented to the engineer in the form of a number of stated "requirements," some of which may be definite facts. Now facts are items of information, oftentimes of very nebulous ancestry, depending for their application to the problem under consideration on their source, their parentage, and the environment under which they have been developed—in which, of course, they are much like the human race. It will first, therefore, be imperative to reach far back into his philosophical equipment and determine which facts are legitimate, which are based on sound assumptions, and which are contrary to all the laws of God and man but which may, nevertheless, directly affect the matter under consideration.

Three Questions of Design

Having made such differentiation, he may next find himself very naively asked to do the impossible. On the one hand the owner may merely ask that a plant to produce a specified quantity of product be built; on the other hand, the operating men and the process development men may insist that the designed capacity of each individual piece of equipment be upped to such extent that all sorts of shutdowns and contingencies will be cared for. As compared with a designed capacity based on the six-day week operation at 90 per cent attainment of capacity, such increases in size or provision of spare equipment not only put excessive depreciation and maintenance costs on the product but also tend to permit inefficient and sloppy operation. It is in the endeavor to meet such diverse demands that the definition of philosophy as "fortitude in enduring suffering" becomes very real indeed.

Beyond this point in any design problem the design man must meet and answer innumerable questions of economics, safety, services, and such other auxiliary problems as have a bearing on the completed job. The direct problems of design, he must and can solve by the use of the basic engineering information obtained by scholastic and professional training; but even in solving these he must be guided initially by a design philosophy which has been acquired, either partially during his preliminary professional career or wholly since beginning its practice. This philosophy requires that he answer the three essential questions of design development:

Shall I design individual units on a basis of average production requirements? This question presupposes a reasonable capital investment with such production peaks as may come from sales fluctuations being cared for by the six day, 90 per cent attainment specification.

Shall I design individual units on a basis of minimum production requirements? This produces only the minimum facilities with a consequent small investment, but necessitates the highest possible operating efficiency and constant attention to provide for peak requirements.

Shall I design individual units on a basis of maximum production requirements? This design basis is, of course, the dream of all operators in spite of the tremendous increase in investment necessary. It allows great leeway in production, permitting laxity with both operating labor and supervision because potential reserve capacity is always present.

Of course the selection of one of these three bases for handling any problem is somewhat contingent on the owner's attitude, his financial capacity, and eventually on the particular operating man's ability and resourcefulness. But the important consideration is not which development may have been selected as the correct procedure, but the fact that he has acquired a philosophy which makes such selection a natural part of his design procedure.

I do not believe that such philosophy must derive from professional experience only. I am sure that many teachers who are charged with the education of our future engineers already, either by indirection through daily contact or by direct exposition, endeavor to make their minds at least receptive to the acquisition of a philosophy or attitude of mind that will broaden their professional usefulness. But cannot this preparation be more definite and more individual than may now be the case?

No Imagination, No Philosophy

What ingredients go to make up a philosophy I am unable to say, but I am sure of one, and that one is imagination. Probably the common failing of both of the two extremes of design men mentioned earlier is the lack of imagination. Do we not find ourselves prone to call for facts, facts, and more facts to the exclusion of all else when what we really want is merely the ability to differentiate between facts and opinions or to see facts in true relationship to other facts? If there is no philosophy, no imagination, no calm judgment, then neither facts nor opinions mean anything in the consideration of a chemical engineering problem. Along with this philosophy of design, it is my opinion that, being human, a good designer must have the definite certainty in his own mind that of all the parts that go to make up a complete project, design is the most important.

Reviewing the Equipment Parade

During October when Chem. & Met.'s *editorial Preview of the Chemical Show was in preparation a good many exhibitors were unable to release details on their showings of equipment developments, new since the 1937 Exposition. Backed by many interviews at the Show, your editors now report on the omissions from November Preview.*

THE CHEMICAL EXPOSITION of 1939 which was held during the week of December 4 at the Grand Central Palace in New York, was one of the best ever held from the standpoint of useful attendance, and was the largest in number of exhibitors and space occupied since the boom days of the last decade. Best dressed of any of the 17 Expositions in the long series, it was also one of the most productive in the number of new developments it introduced. What follows continues the record of these new developments which was introduced in the 34-page Preview in our November issue.

Drying and Heating Equipment

The feature of the booth of the Buffalo Foundry & Machine Co., Buffalo, N. Y., was a large, atmospheric double-drum dryer, equipped with a new type of feeder for feeding pasty materials to the dryer. This feeder is a steam-jacketed tube extending the entire length of the dryer and provided with a number of discharge tubes for uniform distribution. A rotating agitator inside the feeder is designed to convey the material equally to all discharge points.

Described in our Preview was a new gas-fired direct air heater introduced by the Despatch Oven Co., Minneapolis, Minn. It was mentioned in that report that a new type of firing known as control combustion would be introduced and described at the Exposition. In this new combustion method, the heater burner is interconnected with refractory-walled primary and secondary combustion chambers. As the hot products of combustion leave the refractory chamber, they are diffused by an adjustable back-pressure baffle, and diluted by recirculating and fresh air drawn into the heater. Through the adjustable feature unburned gas odor is eliminated, according to the manufacturer and efficiency markedly increased, regardless of operating conditions.

A model of a new type dryer was exhibited by Hersey Mfg. Co., South Boston, Mass. It is called the Hersey Intermediate Feed dryer, and the outstanding feature is that the feed is introduced into a recirculated gas stream. This recirculated stream then goes to a cyclone separator where the dust is separated. Heavier particles fall into the inlet of a rotary concurrent dryer. Overhead gases from the cyclone are blown partly up the stack and partly back to the furnace for reheating. At the end of the rotary dryer, the product drops into a hopper and the overhead gases go into the recirculating stream where they pick up new feed and are taken again into the cyclone. The equipment is applicable only for light, fluffy, dusty types of materials, but for those materials it is said to provide economical drying and to eliminate the dust problem.

A new type of vibrating-conveyor dryer, shown by the Jeffrey Mfg. Co., Columbus, Ohio, is known as the Type H Jeffrey Traylor dryer. Whereas in the past most electrically vibrated conveying equipment has required considerable headroom for the electric vibrating elements, the new dryer requires very little vertical space and so may be built with a number of decks superimposed one over the other. This dryer is built in widths up to several feet and is designed to maintain uniform distribution of a thin layer of material moving over its heated surface. A jacket for hot gases beneath the conveying surface is baffled to provide uniform heat distribution.

Sta-Warm Electric Co., Ravenna, Ohio, is introducing to the chemical field its line of electric heating equipment. A line of glue pots and wax kettles constructed of various corrosion resistant materials were shown. Their outstanding feature is that the electric heating coil is wrapped around both the sides and bottom of the vessel in such a manner that heating performance equivalent to water jacketing may be attained.

Struthers Wells-Titusville Corp., Titusville, Pa., showed a radically new design of double-drum dryer of extremely rigid construction. An important feature of the new design is the knife support, a heavy tube in which is spur gearing having sufficient reduction to be non-reversible. A handwheel readily sets the knife contact. The blade may be bowed or adjusted in any manner desired.

Fluids Handling

A totally new type of submerged acid pump which has no packing, no gland and no seal of any kind was displayed by Allen-Sherman-Hoff Co., Philadelphia, Pa. The new pump and its accessory parts are completely rubber-lined, using this company's Maximix rubber pump-lining composition. A striking feature of the design is the use of a float-controlled constant-level feed tank, beneath which the pump itself is attached, with the impeller horizontal and the shaft vertical. Three flexible rubber inlet valves supplying acid to the constant level chamber are controlled by a rubber-covered float. The rubber-covered pump shaft passes upward through the suction chamber to the motor which is mounted on the chamber top. A simple cone-type rubber flinger which rotates without contact with adjacent parts is employed to avoid damage from upward splash.

In the booth of Black, Sivalls & Bryson, Inc., Oklahoma City, Okla., was shown a new chemical feeder, an instrument designed to be hooked on to a liquid line to inject chemical. It consists of a reservoir for holding the chemical and a plunger pump operated by gas pressure. The entire unit is small, weighing only 290 lb. Another new development of this company is a combination safety head and relief valve, designed for the protection of chemical reaction equipment. It is essentially a safety head and pop valve in series. The safety head protects the pop valve, keeping it from becoming gummed up, and the relief valve provides protection against excessive loss of material. In operation if the safety head is blown, the relief valve then opens allowing the pressure to drop until the relief valve may again be seated.

In addition to the new glass pump which has already been described, Corning Glass Works, Corning, N. Y., exhibited its new gage glasses designed for easy reading. The glasses have a strip of colored glass fused down one

side of the tube. When illuminated from behind, light is diffused throughout the liquid and the part of the tube containing liquid appears entirely colored. The company also exhibited a new line of Pyrex fittings which are larger than ever before—4 in. I.D.

Included in the new and complete line of corrosion-resistant valves and fittings exhibited by the Crane Co., Chicago, Ill., which were briefly described in our Preview, is a new line of weld fittings with bell ends in which the pipe is inserted and centered prior to welding. A shoulder within the bell has the same diameter as the pipe. Thus the weld is divorced from the inside juncture of pipe and fittings and any possibility of weld metal protruding into the pipe is avoided.

A leading feature of the exhibit of the Duriron Co., Dayton, Ohio, was a new centrifugal pump which will be available in Duriron as well as in a variety of alloy steels. An interesting element of the new design is the means employed to put the stuffing box under a positive suction. This is accomplished by means of a special design of inclosed impeller which has openings extending from the back of the impeller outward into the impeller passages. The shape of these openings is such that an ejector effect is produced, creating a powerful suction behind the impeller and around the shaft so as to eliminate liquid pressure on the packing. A lantern gland is provided for grease or water sealing or sealing with the liquid being pumped. Another interesting feature is the method of "keying" the impeller on to the shaft by means of a low-melting alloy which permits removal of the impeller from the shaft only when the alloy is melted out. This pump will be built in sizes from 1x1 in. to 8x6 in.

This company has recently adapted the use of the Goodrich Flexlock rubber joint to the joining of lengths of Duriron pipe for pressures up to 15 lb. For this purpose, the pipe is cast with smooth ends and a smooth bell socket. Rapid assembly of the joints and both angular and longitudinal flexibility are advantages of this joining method.

Several new developments were shown in the booth of the Hills-McCanna Co., Chicago, Ill. One is a new quick-opening Saunders type diaphragm valve, the operating mechanism of which consists of a handle rotated through about 180 deg. which turns a cylinder in which a spiral groove is cut. A fixed pin in the casing fits in this groove so as to cause endwise motion of the cylinder and lifting of the diaphragm on rotation of the handle. Final setting of the diaphragm on the weir is accomplished by thread action during the last few degrees of the closing turn. This company also showed several new or improved models of proportioning pumps. The small-capacity SA pump has been redesigned for installation of the inlet and discharge connections and corresponding ball valves in a separate removable fitting. The new Type U pump employs two opposed cylinders with plungers driven by a simple rack and pinion, the pinion being rotated through a fixed angularity by a crank and connecting rod. Regulation is obtained by a simple screw adjustment on each plunger shaft. The Type HJ pump is a vertical heavy-duty type provided with two jacketed pumping cylinders for the handling of materials which must be either heated or cooled during pumping.

An ingenious development in pumps for the handling of corrosive materials was shown by the Huber Pump Co., 90 West St., New York City. In this pump vacuum and pressure are created in a flexible tube of rubber, neoprene or other suitable composition, the tube being retained within a cylindrical casing and compressed progressively from its intake to its discharge end by a non-rotating compression ring actuated by an eccentric. Thus liquid is drawn into the tube by the vacuum created through expansion of the heavy tube wall, then forced out of the discharge as the compression point advances. Hence the liquid handled comes in contact only with the tube and no stuffing boxes, gaskets or priming are necessary. This pump is said to develop a vacuum lift of 30 ft. and a discharge pressure up to 100 lb. Available sizes range in capacity from 0.1 to 50 gal. per minute. Both single- and two-stage models are available.

The Wm. Powell Co., Cincinnati, Ohio, displayed representatives of a now complete line of Inconel valves. Another recent development is a flush-type bottom outlet valve made in sizes from 1½ to 8 in. for both jacketed and unjacketed kettles and tanks. This valve is also available with a self-regrinding type of disk for use in cases where the material being handled tends to solidify on the seat and disk.

New to the Chemical Show was the Reed Roller Bit Co., Houston, Tex., which featured the Reed non-lubricated plug valve. The valve is of the type which has a small plug which makes no contact with the valve chamber, i.e., there is a clearance of about an ⅛-in. Sealing is accomplished by two sealing segments which fit into slots on the inlet and discharge sides of the plug. These sealing segments have a crescent-shaped plan view and a rectangular elevation. On the top and bottom extremities are triangular shaped cogs which fit into the slots on the plugs. When the valve is in the closed position hydrostatic pressure against the concave side of the crescent holds the segment against the valve seat. In opening the valve, a mechanical advantage is obtained when the slot in the plug travels along an inclined plane on the cog at the top of the segment. This lifts the segment away from the valve seat, relieving the pressure, so that the valve may be easily opened wide. Thus, because the valve is lifted from its seat and reseated by hydrostatic pressure, there is said to be no wear and no need for lubrication.

Schutte & Koerting Co., Philadelphia, Pa., showed its recently developed carbon-lined steam-jet ejectors which are built for evacuation of process vessels under extremely corrosive conditions. Bronze, steel or other suitable metal is used to form a casing and the necessary flange connections. Carbon is used for the lining of the ejector body and the tail diffuser as well as the steam jet nozzle. When used in two or three stages with jet inter-condensers, the latter are generally lead-lined and provided with stoneware trays.

An improved version of its diaphragm pump for filter-press feeding and other pumping of abrasive and corrosive liquids and slurries was shown by T. Shriver & Co., Harrison, N. J. Two pumping chambers and diaphragms are employed, operated by a single eccentric mechanism, which has been markedly improved and

simplified. Positive support for the diaphragms is afforded in this pump by the motion of a number of concentric rings which back up the diaphragms.

In the booth of the J. H. H. Voss Co., New York City, was shown the new Voss ammonia float valve. In this device there is a short push-rod attached to a counterbalanced float which pushes against a ball bearing in the float housing. This ball bearing is located in a tube which also serves as the inlet tube, and the ball bearing itself acts as a valve. That is, when the float is in the up position, the push-rod forces the ball bearing against an orifice thus shutting off the supply of liquid. When the float is in the down position, the liquid pressure forces the ball away from the orifice and the liquid flows out and into the receiver.

Instruments and Control

In addition to several instruments described in our Preview, the Bristol Co., Waterbury, Conn., showed a new electronic temperature controller of the type actuated by the capacity effect between the pointer of the millivoltmeter indicator and an adjustable control pointer. An ingenious and novel vacuum tube relay opens or closes the control circuit. This system is said to be without appreciable reaction between the indicating and control systems.

A recently developed line of off-and-on temperature controllers employing a bimetallic thermostatic element for control in various ranges from —100 to as high as 1,400 deg. F. was exhibited by the Burling Instrument Co., Newark, N. J. These instruments feature adjustable setting range, ample silver contacts for direct operation of solenoid or motor-operated valves or power contactors, and high accuracy. Differentials as low as ±¼ deg. may be secured. Snap-action switches which either open or close on temperature rise may be secured, as well as double-acting, three-wire models.

Several new instruments were shown by the Cambridge Instrument Co., New York City. One of these is a unique recorder for the moisture content of a moving web, such as paper or fabric. Operation of this instrument depends on measurement of the equilibrium relative humidity of the web material by withdrawing a continuous sample of air from the surface of the material into a porous cylinder. The air sample affects a hygroscopic element, altering its length and changing the opening of a valve connecting with a vacuum source. The recorder then measures and records the resulting vacuum in terms of moisture content. Another new and novel instrument is a dissolved oxygen recorder intended principally for measurements on boiler feedwater. Hydrogen produced as required by a small electrolytic hydrogen generator is mixed in a venturi with the continuously flowing water sample. The displaced oxygen and undissolved hydrogen then pass through a thermal conductivity gas analyzer which records in terms of dissolved oxygen. The instrument reads down to 0.01 p.p.m. An improved model of thermal conductivity gas analyzer for both oxygen and carbon dioxide in flue gases was shown. Another new instrument shown is an improved flow-type pH meter employing a glass electrode. A thermionic amplifier unit using no batteries, operating on alternating current, and designed to take care of line fluctuations as high as 30 volts, is used, together with a conventional potentiometer recorder.

Dings Magnetic Separator Co., Milwaukee, Wis., exhibited a working model of the company's new magnetic detector. The machine is essentially a permanent magnet suspended over a conveyor belt. Metallic substances cutting the magnetic lines of flux cause a warning bell to ring.

The Foxboro Co., Foxboro, Mass., showed a new design of time-temperature potentiometer indicator controller which is equipped with a cut metal cam to give any desired temperature cycle. A follower traveling on the edge of the cam adjusts a contact sliding on a straight slide wire. Another new development shown was a panelboard illustrating a complete set-up for controlling various functions of a process. Another new instrument is a throttling electric potentiometer pyrometer recorder-controller. In this instrument, a cylindrical cam extending across the width of the strip chart is positioned by a roller directly connected to the recording mechanism. This cam causes rotation of a contact brush moving over a slide wire which is part of a bridge circuit. A second slide wire incorporated into the control valve motor is also part of this bridge. Movement of the cam owing to departure of the instrument from the control point upsets the balance of the control motor bridge circuit, thus starting the motor, changing the valve opening and restoring balance of the circuit.

A new system for automatically regulating the power input to electrically heated equipment such as furnaces was shown by the General Electric Co., Schenectady, N. Y. Known as the Reactrol system, the new method operates by varying the voltage impressed on the heating resistors. In its simplest form, this system consists of a temperature or pressure control instrument and a saturable-core reactor. The temperature or pressure control instrument, which contains a special potentiometer, feeds low-voltage current into an amplifying tube which in turn regulates the flow of direct current to the reactor. This, acting like a valve, regulates the applied voltage.

Its recently developed pH meter and glass electrode system for continuous automatic measurement of pH were shown by Leeds & Northrup Co., Philadelphia, Pa. This instrument is also suitable for use with the quinhydrone or hydrogen electrode. The meter is designed for much higher resistance in the external circuit than is actually necessary with the glass electrode supplied.

Pittsburgh-Equitable Meter Co., Pittsburgh, Pa., exhibited two new meters, one a positive type and the other an orifice meter. The positive meter, intended principally for water, is known as the Pittsburgh IMO and is a development of the basic Swedish IMO rotary pump design. Claimed to be the most accurate commercial water meter made, this device employs three spirally grooved rotors which mesh with each other and fit the bore of a casing. Under propulsion of the water, these rotors rotate continuously, the threads acting as a continuous piston. The center or power rotor drives the integrating mechanism, the side rotors doing no work and serving only as seals. High accuracy is claimed even at low rates of flow. The new orifice meter, known as Type 38, is a two-pen recorder, recording both the differential and the static pressure. A unique design of mercury manometer is employed, suitable for working pressures up to 4,000 lb. and made from alloy steel forgings. A new differential movement eliminates the usual "angularity error." A new pressure-tight bearing incorporating radial thrust bearings in each end is another

feature. Liberal use has been made of stainless steel in many parts.

An interesting self-regulating flow controller for the automatic regulation of liquid discharging to the atmosphere was exhibited by Schutte & Koerting Co., Philadelphia, Pa. This device, known as the Rotostat, consists of a flow nozzle containing a butterfly valve, beneath which a small conical vessel is suspended. The bottom outlet of this vessel is a nozzle which can be adjusted by a calibrated ring. The suspension for the vessel is interconnected with the butterfly valve and counter-balanced. The vessel is set to discharge at the required rate and then balances in such a position that the butterfly valve will discharge at this rate. Any change in weight of liquid in the vessel, indicating a change in discharge rate, will correct the butterfly setting.

Several developments were exhibited by the Taylor Instrument Cos., Rochester, N. Y. One of these is one of the Lapp Insulator Co.'s new chemical porcelain Y valves, equipped with a Taylor Motosteel Evenaction diaphragm top for actuating the plunger of the valve. To secure accurate valve response in the face of the large packed area required for a porcelain plunger, the diaphragm top incorporates a valve positioner. Another new development is an explosion-proof electric clock for use on recording instruments. This clock is now being submitted for Underwriters' approval. Still another new instrument is this company's indicating psychrometer for duct mounting. In this instrument, the wet and dry bulb thermometers are mounted on a hinged plate so as to swing the bulbs into the duct. A water reservoir is mounted on the outside of the plate.

Uehling Instrument Co., Paterson, N. J., exhibited a complete new line of draft gages, direct reading manometer-type pressure and vacuum gages, U-tube pressure gages, liquid-level meters, absolute pressure gages and vacuum indicators. Draft gages are of the inclined-tube type, and are available as single and multiple units, flush or panel mounted. The Type S Tank-O-Meter is a liquid level meter operating on the hydrostatic principle.

Among the new devices shown by Willson Products, Inc., Reading, Pa., was the Willson Thermo-Anemometer. This is an instrument for measuring air velocities and is used in conjunction with air conditioning equipment. It operates on the principle that the air whose velocity is being measured lowers the temperature of an electrically heated thermometer and the difference in temperature between the heated and unheated thermometers varies (at a given voltage) with the air velocity. The instrument can measure velocities over the range from zero to 6,000 ft. per minute with less than 2 per cent error. This same company exhibited a number of new and improved types of dust count apparatus.

A new lead alloy was shown by American Smelting & Refining Co., New York, which is said to be hard, abrasion-resistant and to have nearly twice the tensile strength of antimonial lead. It contains calcium, magnesium and tin in small quantities and finds its principal use in cable-making.

Materials of Construction

Arcos Corp., Philadelphia, exhibited its new $\frac{3}{32}$ and $\frac{1}{4}$ in. flux-coated stainless steel arc welding electrodes which are especially designed to weld sheets of stainless as thin as 0.010 to 0.015 in. These may be used in conjunction with welding machines employing mercury arc rectifier tubes. Phosphor bronze arc welding electrodes having a tensile strength of 48,000 lb. per sq. in., with an elongation of 46 per cent in the as-welding electrodes are also new with this company.

A high-temperature insulating refractory brick shown by the Carborundum Co., Niagara Falls, N. Y., and known as Alfrax BI, is a new type of alumina refractory of good load-carrying qualities at 3,200 deg. F. A standard brick weighs 4 lb. and has a thermal conductivity of approximately 2.9 B.t.u. per hour, sq. ft., deg. F. and inch as operated. The insulating quality of this material is stated to be due to pores within the particles of the material itself rather than between particles. This company demonstrated also the new Type AT air-cooled-terminal Globar electric heating element made by its Globar Division. Elements of this type are now available in lengths up to 50 in. and diameters up to $1\frac{1}{4}$ in., and are a decided simplification over earlier types in that no special clamping method or cooling means is required for the terminals. This result is obtained by making the center or heating section of silicon carbide having an electrical resistivity of about 1×10^5 microhms per centimeter cube at 1,900 deg. F., while the ends of the elements which extend through the furnace wall are of a special composition having a resistivity of about 3×10^3 microhms per centimeter cube at 300 deg. F. Thus these low resistance ends remain comparatively cool, even at high temperature operation of the heating section. Such units are stated to be easy to install and to require no maintenance. A modification of this type used where especially thick furnace walls are required, employs separate terminal rods.

Silver-Stainless is the name of a new alloy steel exhibited by the Chemical Foundation, Inc., New York, which has the outstanding advantage of resistance to pit corrosion. In addition it is said to be easily machinable and has the property of low work-hardening. Developed at M. I. T. the alloy is characterized by the fact that it contains silver to the extent of less than 1 per cent. Because the alloy is not susceptible to pit corrosion, it lends itself to the fabrication of chemical equipment. This material will be available shortly as rolled sheets and castings.

Electro-Chemical Supply & Engineering Co., Division of Ansul Chemical Co., Paoli, Pa., announce that all of its Duro acidproof brick, samples of which were displayed, is now produced with the aid of de-airing.

New at the Chemical Show is the Harrington Paint Co., Inc., East Cleveland, Ohio, and in addition to exhibiting its line of chlorinated rubber paints for industrial use, it showed a new product called Betonite No. 370. This material is a hard rubber-resin-base floor covering which is applied in a thick (0.012 in.) layer with whitewash brushes. It is said to work well on concrete as well as other floors and to withstand heavy trucking conditions.

The Haveg Corp., Newark, Del., showed a complete pilot-plant set-up of equipment constructed of Haveg, most of which is of new design. The plant was originally built for investigation of a process for hydrochloric acid digestion of a fibrous raw material in the company's own plant. Included in this set-up was a portable suction filter; a digester equipped with a cone valve having a neoprene seal, and a tantalum bayonet-type heating element; and a Haveg-body condenser with Haveg tube sheets and removable carbon tubes. Vapors are removed from the digester by means of a Schutte & Koerting Haveg ejector operated on water pressure. Another Schutte-Koerting ejector operated on steam and having a Haveg body and combined lava and carbon steam nozzle, provides vacuum for the suction filter. Valves in the installation are Haveg-bodied Hills-McCanna Saunders type diaphragm valves with neoprene diaphragms.

A new line of electric immersion heaters made of graphite was shown by Heil & Co., Cleveland. Thermometer wells made of the same material reinforced with metal were also shown. The reinforcing material is in the form of a perforated tube to which the graphite is bonded with cement.

In addition to the new developments in impervious carbon equipment described in our Preview, the National Carbon Co., Cleveland, Ohio, also displayed a new line of carbon-body Saunders type diaphragm valves made by the Hills-McCanna Co. of Chicago.

In addition to the several new developments described in our Preview, the United States Stoneware Co., Akron, Ohio, exhibited a new tower packing ceramic shape known as Star packing. This unit consists of an elongated body from the meridian of which radiate five star-like points. Advantageous properties of this shape are stated to include lower draft loss than for equivalent raschig rings, less side thrust owing to partial interlocking characteristics.

Materials Handling and Weighing

An automatic weighing feeder made in two sizes, one to handle from 1 oz. to 12 lb. and the other for 2 oz. to 40 lb. per minute, was exhibited by the B. F. Gump Co., Chicago, Ill. This machine which is

similar in principle and appearance to the Auto-Check Gross Weigher exhibited at the 1937 exposition, differs from the latter in that it is intended for the accurate continuous feeding of powdered or granular chemicals, rather than for packaging. A timing device is provided for regulating the number of discharges of the feeder between 1 and 30 per minute. Other controls permit close regulation of the weight of each discharge.

The Dracco Corp., Cleveland, Ohio, featured two pieces of new equipment. One was a redesigned pneumatic conveyor system for transporting granular materials. The outstanding feature of the new design was a gate discharge lock, designed especially for handling abrasive materials. Operating on the principle of an air lock, the device has three gates in series, forming two chambers. The upper gate opens intermittently allowing a definite amount of material to drop from the receiver into the first compartment. When this is filled, the upper gates close and the middle gates open, allowing the material to drop into the second compartment. Now the middle gates as well as the lower gates are airtight and when the material is in that compartment and both gates are closed, a valve is opened breaking the vacuum. When the pressure has reached atmospheric, the lower gates are opened and the material drops into a hopper.

Another development in the Dracco booth was a new type of automatic bin level indicator. In the bin is a tell-tale weight attached to the end of a cable. The cable runs out the top of the bin and over a number of pulleys to the indicator mechanism. There the cable is wound on a cable drum which is rotated by a small motor. Now, when the device is put in operation, the drum revolves, unwinding the cable until the tell-tale weight rests on material in the bin. At this point a Mercoid switch reverses the motor, which then winds up the cable for a predetermined time until a time delay switch again reverses the motor. Then the tell-tale weight drops once more until it again comes to rest on material in the bin. This cycle continues until the bin is filled; then a second Mercoid switch shuts off the bill-filling mechanism. When this device is used the bin level can be read from a gage.

In an operating exhibit of the pneumatic conveying of pulverized solids, the Fuller Co., Catasauqua, Pa., exhibited its recently developed bin level indicating device. This consists of a paddle suspended in the bin and rotated slowly by a Telechron motor, the latter being contained in a dust-tight housing. When the level of material reaches the paddle and arrests its rotation, the motor rotates about the paddle shaft, thus tipping mercury switches to operate an alarm or start or stop the conveying mechanism.

A new development in materials handling is the Mass-Flo conveyor shown by the Jeffrey Mfg. Co., Columbus, Ohio. In this conveyor a steel casing is used through which solid pivoted flights spaced at intervals on a single strand of chain move the material in a solid mass or column. It is claimed that the action is so gentle that there is little if any agitation of the material and hence negligible degradation. The new conveyor is self-feeding and self-cleaning, operating equally well at either full or partial load according to the manufacturer. Material may be handled vertically, horizontally, or at any angle.

New equipment exhibited by the Mercury Mfg. Co., Chicago included a center control electric-powered fork truck. It is built in capacities up to 10,000 lb. and its outstanding features are lightweight and compactness, making it suitable for operation in cramped spaces and in multi-storied buildings, especially where floor loads are limited. The truck may be had in telescopic or non-telescopic types.

Two-wheeled hand trucks for special jobs made by the Nutting Truck Co., Faribault, Minn., were shown by George C. Lever Co., New York City. One was a self-loading barrel truck whose curved nose fits around the small end of the barrel, made to fit barrel heads from 17 to 21 in. in diameter. A second was a one-man wooden barrel truck distinguished by a loop from handle to handle which fits over the head of the barrel. A third type of new truck was the Tote-Box truck which has two prongs suitable for lifting boxes by the handles, or acid carboys.

Revolvator Co., North Bergen, N. J., exhibited its new all-hydraulic Red Giant liftruck. It has a number of advanced characteristics such as automatic shut-off, foot-lever load release, telescoping frame, leak-proof hydraulic system, non-kicking handle, angle lift, etc.

A new scale for the weighing of small batches and the packaging of chemicals in amounts up to 5 lb. was introduced at the Exposition by the Toledo Scale Co., Toledo, Ohio. This scale, known as the Speedweigh, is of the even-balance, over-and-under type in which material is weighed against accurate weights, any overage or lack being indicated by a pointer moving on a scale. Both center- and end-tower models are available.

In the booth of the Yale & Towne Mfg. Co., Philadelphia, Pa., was featured their new power fork truck, with center control. The truck is made in a number of models featuring multiple lift, tilting forks, revolving forks, etc. These trucks are built in units of 1,000 to 50,000 lb. capacity.

Mixing and Grinding

In addition to the new machines described in our Preview, Eppenbach, Inc., Long Island City, N. Y., exhibited the new Homo-Grinder, a portable mixer for homogenizing and grinding without incorporating air in the mixture. This machine consists of a motor, a driveshaft, a turbine-type homogenizing head and an adjustable grinding unit. A central revolving turbine draws material up from the bottom of the tank and forces it at high pressure through stationary blades. Material is then forced upward through the gap between a rotor and stator where it is mechanically and hydraulically sheared. It then passes radially outward to the sides of the tank and flows downward without vortex action.

Kent Machine Works, Inc., Brooklyn, N. Y., exhibited its new Kent Midget three-roller mill. Rolls on this machine are 2½ in. in diameter by 3½ in. long and of hardened steel. The mill, small enough to use a ¼-hp. motor, is designed primarily for making test grindings to determine formulas, etc. It is claimed that results obtained with this mill can be reproduced in the large plant-sized Kent mill. An outstanding feature of the machine is the so-called Kent quick release which enables an operator to clean the rolls without disturbing the adjustment.

Lancaster Iron Works, Inc., Lancaster, Pa., exhibited its new L W mixer. This is of the rotating pan type, having two blades, one of which is fixed and one rotating. The fixed blade moves the material away from the side walls of the pan, and the center blade rotates on an eccentric shaft. This is a small-capacity mixer built in sizes from 1 to 5 gal.

Raymond Pulverizer Division of Combustion Engineering Co., Chicago, Ill., showed a new small-production impact pulverizer designed especially for easy cleaning and equipped with a variable speed motor to drive the screw feed. Another new machine is a small laboratory pulverizer with hand-operated screw feed. A new laboratory air separator for pulverized materials was also exhibited, the claim being made of performance fully equal to production size machines in all particulars except capacity. Separations down to 325,400 mesh are said to be possible.

In addition to new equipment in the booth of Sprout, Waldron & Co., Muncy, Pa., already described in our Preview, this company exhibited a new heavy-duty knife-cutter. Several times larger than any cutter the company has made before, this unit weighs 2½ tons, has a streamlined five-blade solid cast-steel rotor weighing 1,400 lb. There are four bed knives, placed 90 deg. apart around the rotor. The extreme weight of the rotor gives it a flywheel effect and in addition the machine is designed so that only two knives can be in shear any one instant.

New at the booth of Turbo-Mixer Corp., New York, was the Turbo Saturator. This is an entirely self-contained unit which may be suspended in a tank or storage vessel to provide intense mixing of air or gas with liquid. The driven unit consists of a cylinder which is partly immersed in the liquid. In the bottom of this cylinder is an impeller which acts as a pump to draw the liquid into the cylinder and force it out at the top. Just

above the top of the cylinder, and mounted on the same shaft as the impeller, is a rotating impingement plate fitted on the bottom side with a number of radial fins. The impingement plate is cut away at intervals, leaving the fins to act as fan blades. When the vertical shaft is rotated at high speed, the impeller draws up the liquid which is then dispersed laterally and vertically into the air space by these rotating fins.

Among the new developments exhibited by Struthers Wells-Titusville Corp., Titusville, Pa., was a new liquid mixer known as the Turbine Diffuser. This machine, which is designed in two general types, either for mixing liquid and gas, or liquid and solids, employs a high-speed turbine impeller, direct connected to the motor and provided with blading designed for radial discharge without stationary diffuser vanes. For dissolving gases this mixer is equipped with a draft tube and gas-tight cover for the tank. Otherwise the draft tube is not required.

Packaging

The Cleveland Container Co., New York City, exhibited at the Chemical Show for the first time its line of new low-cost fiber drums. The drums are characterized by light weight because tops and bottoms are also of paper. Cellophane and Pliofilm are used as lining materials when required.

A new shipping drum for dry bulk materials, available in sizes from 35 to 75 gal., and known as the Leverpak, was exhibited by the Container Co., Van Wert, Ohio. This drum is formed of fibrous material and is supplied with a heavy beaded reinforced metal cover and a tight-fitting, lever-actuated locking band for sealing the cover into position. The full-open top is reinforced with metal, as is the resilient bottom chime. Light weight, freedom from contamination and pilfering, and sift-proof sealing are important features.

A new type labeler was exhibited by the Economic Machinery Co., Worcester, Mass. It differs from earlier designs in that the glue pot and gum rollers are mounted on a rocking cradle. This cradle rocks in such a way that when the label passes over the rollers, only half of the label is gummed at a pass. That is, when the label is traveling toward the right, the left end of the label is gummed, then as it moves back toward the left, the right end of the label is gummed. This procedure prevents leaving an excess of gum on one end of the label at the end of a stroke.

Emsa is the name of a new semi-automatic vacuum bottle filler exhibited by Ertel Engineering Corp., New York City, which is designed to eliminate the troublesome and expensive racking of bottles in trays. With this machine, the bottles are placed in a straight line between adjustable guide rails and moved directly to the filling position under the spouts. The actual filling may be done by the operator from a sitting position by means of a foot pedal which responds to a light touch.

In addition to a number of new nickel-containing alloys described in our Preview, the International Nickel Co., New York, exhibited new batch cans and shipping drums, fabricated by the Draper Mfg. Co., Cleveland, Ohio, and made of steel with linings of Monel metal, nickel or Inconel. These drums are made in 30, 55 and 110 gal. sizes. For example, in the 55 gal. Monel-lined drum, built to I.C.C. specification No. 5, the shell is 16 ga. steel and the Monel liner 0.021 in. thick. Liners are applied by expanding into the steel shell. Heads are applied with a double-locked seam and an inert sealing compound.

Keystone Drum Co., Pittsburgh, Pa. showed a line of new fiber drums for one-time shipment. The drums have metal caps and bottoms and can be procured with crimped, open top or bolted lids. One type is equipped with a collapsible head for materials that settle on cooling. That is, the empty drum has a head the shape of a frustrum of a cone and upon filling, it is loaded all the way up the cone. However, when the material settles, the cone part is above the level of the material. Then by simply rolling another barrel over the drum head, it collapses accordion-fashion, thereby filling the drum completely.

An improved line of label pasters, for applying adhesive to container labels of widths up to 11¾ in., was exhibited by George C. Lever Co., New York City. This paster, known as the Stikfast and made by Diagraph-Bradley Stencil Machine Corp., St. Louis, Mo., is built in three sizes for hand operation and is also available with a drive motor. Easy cleaning, corrosion-proof construction, simplicity of design, and positive adjustment are important claims for this machine.

Pressed Steel Tank Co., Milwaukee, Wis., demonstrated one of its new two-piece 55-gal. shipping drums of the type now being supplied for sulphuric acid and aqua ammonia. Owing to the fact that this drum is constructed of two deep-drawn "cups" joined together with only a single circumferential welded seam, its life is stated to be much greater than earlier types. Reinforced chimes are attached to the top and bottom, and rolling hoops welded to the sides. Heat treatment is employed for acid drums and internal passivation for ammonia drums. Both comply with I.C.C. requirements. This company also showed a new stainless steel carboy for acids, made in 13 and 15 gal. sizes.

Process and Other Equipment

A new piece of welding equipment known as the Weld-O-Tron, and intended for the joining of extremely thin corrosion-resisting metals and alloys for process equipment, was shown by Allis-Chalmers Mfg. Co., Milwaukee, Wis. This welder uses specially developed small welding rods and operates with currents as low as 5 amp. It is an electronic device employing a six-tube mercury arc rectifier of the hot-cathode type which is noiseless in operation and claimed to be of long life.

Another new Allis-Chalmers electrical development exhibited was a single-anode type power rectifier designated as the Excitron. Instead of having all the anodes in one vacuum chamber as is common with mercury arc rectifiers, the new type consists of a factory-assembled group of relatively small vacuum tanks, each containing a single anode and its individual cathode. These tanks are externally cooled by water and generally mounted in groups of six on a framework which also supports the vacuum pumping equipment. Owing to closer spacing of anode and cathode, the voltage drop in this type of rectifier is considerably reduced as compared with multi-anode types so that the Excitron is 3-4 per cent higher in efficiency at output voltages in the range from 200 to 300 volts. At 600 volts, however, Excitron efficiency is comparable to that of the

multi-anode rectifier. This equipment, therefore, is particularly suited to smaller electrochemical installation which can benefit from the higher efficiency of lower voltage.

The American Foundry Equipment Co., Mishawaka, Ind., exhibiting for the first time, showed its redesigned Dustube dust collector. The machine is of the shaking bag type and is novel in that it uses as a shaker a rocker arm connected to two rows of bags. This means that when one row of bags is jerked upward and sidewise, the other row is allowed to slacken.

The du Gas fire extinguisher, developed a number of years ago, has recently been taken over by a new concern known as the du Gas Engineering Corp. of Chicago, a subsidiary of the Ansul Chemical Co. of Paoli, Pa. The active principle in this extinguisher is a dry, non-caking, non-toxic powder which, when thrown or sprayed upon a fire, generates a large volume of carbon dioxide and so blankets the burning material. Extinguishers using this material are available in sizes from those suitable for fire engine use down to hand shakers. In the larger portable and fire-department models, the powder is blown from the extinguisher by carbon dioxide or nitrogen gas under pressure. It can be blown in this manner through up to 500 ft. of hose. The powder is claimed to be non-injurious to materials with which it may come in contact.

A new pyramidal type of Stedman packing, developed by D. F. Stedman and put on the market by Foster Wheeler Corp., New York City, was exhibited by this concern. This material is made of fine-mesh wire screening and can be produced in any metal that can be drawn into wire. The packing is formed into units of various shapes such, for example, as cylinders of various sizes and lengths, and equilateral triangular prisms. Each unit is formed of a large number of punched and embossed screens welded together. Each individual screen is punched with a considerable number of round holes set in triangular relation to each other, with raised triangular pyramids between the holes. Assembly of the individual screens is such that adjacent screens are welded together with the holes staggered, each hole being covered by a pyramid in the screen above. Triangular prismatic units are employed for the packing of large towers, the tower being hexagonal in cross-section and filled with the units across its entire cross-section. The company is prepared to supply towers in any desired cross-sectional area, packed with such units. Good flow properties, low resistance and self-supporting character are important claims. Both liquid-gas contacting and fractionation can be handled.

Hanovia Chemical & Mfg. Co., Newark, N. J., exhibited three new products. One was a unit water sterilizer with a capacity of 450 to 600 gal. per hour. It operates with a high intensity mercury lamp which consumes 1 kw. of power, providing ultra-violet irradiation which, if exposed to the skin, would produce a severe burn in a fraction of a second. A second new product is this company's line of quartz mercury arc lamps for exposing photoprints. Blueprints, etc., can be made at the rate of 20 ft. per min. with the use of one of these lamps. They are of the high pressure type made in sizes up to 5 ft. long, utilizing 5 kw. They are distinguished by the fact that they have no mercury pool, the mercury being distributed throughout the length of the tube. A third piece of equipment is the new Safe-T-Aire sterilizer. It is a low-current, high-voltage lamp which produces very short ultra-violet waves, 90 per cent of which are of a given length. It is used in conjunction with air conditioning.

The Hydraulic Press Mfg. Co., Mt. Gilead, Ohio, showed its new Model 40-H-2 injection molding press which consolidates the injection unit and the clamp unit. Hydraulic pressure is applied by two pumps, a radial pump to provide high pressure, and a gear pump to provide volume.

International Nickel Co., New York City, also showed a woven wire metallic tower packing available not only in nickel, Monel, Inconel and other nickel alloys, but also in other drawable metals. This packing, made by the Metal Textile Corp., Orange, N. J., is stated to be self-supporting, even in very large towers, to have up to 98 per cent open area for low pressure loss, and to give a high and predeterminable amount of surface area per cubic foot. The wire mesh is supplied in the form of small tight coils which are stacked in the tower and are readily removable for cleaning.

A method for pulping various cellulosic materials such as wood chips, bagasse, flax, wheat, oat and other straws, was exhibited by Paper & Industrial Appliances, Inc., and American Defibrator, Inc., New York. This process, employing the Asplund defibrator, was developed in Sweden. The process employs mechanical defibering at high temperatures, usually about 350 deg. F., and at pressures above atmospheric, and is said to yield a fiber of unique characteristics for the production of such materials as insulating board, hard-pressed boards, roofing and flooring felts.

By reason of the high operating temperature of the process, the membrane which binds the individual fibers together, known as the middle lamella, loses its cementing power. Chips or other materials are first heated with steam in a compression chamber, then forced by a screw conveyor between the grinding disks of the defibrator. The result is said to be a pulp of original fiber length, containing the lignin content and with the fibers undamaged.

This company also showed the new Laurel fiber classifier, a device developed in Laurel, Miss., for paper mill use in classifying fibers according to length. A cylinder containing three reciprocating screens is filled with pulp which is given a circular motion so as to prevent the fibers from going through the screen endwise.

E. W. Pike & Co., Elizabeth, N. J., had a new item in their line of inspection lenses. It consists of a small flashlight to which is attached at right angles an inspection lens. The flashlight is suspended from an extension cord connected to a power source. The entire unit is small enough so that it may be suspended in a valve or other dark place.

A new unit shown by Claude B. Schneible Co., Chicago, Ill., was its Midget Multi-wash dust and fume collector. Employing the same principle as its large Multi-wash unit, the Midget is a completely self-contained, 3½-stage Multi-wash unit, which includes a settling tank, a recirculating pump, a suction fan, and a sound-deadening diffuser pad. The collector is portable and needs only to be plugged into an electric outlet to operate. It is available in sizes from 300 to 1,500 c.f.m. capacity.

An interesting new development of

Struthers Wells-Titusville Corp., Titusville, Pa., is a new self-sealing cover for autoclaves and other equipment for 10,000 lb. and higher pressure. This cover, which is available in diameters from 4 to 18 in., can be supplied for autoclaves ranging in size from 1 qt. to 500 or more gallons. The closure is of the type in which a seal ring operating against a shoulder on the cover makes a tighter and tighter fit, the higher the internal pressure. The cover is dropped into the opening. Then the seal ring is dropped in and a nut, through which the cover passes, is screwed into the autoclave body. Finally, a closing nut is screwed on to the cover so as to lift the latter, forcing its sloping shoulder against the seal ring to effect initial closure. As noted, raising the internal pressure then produces a tighter and tighter seal. The effect of this construction is to eliminate the customary heavy bolting and produce a much smaller and lighter cover construction.

Separation Equipment

In the booth of the Ajax Flexible Coupling Co., Westfield, N. Y., was shown this company's new cable-suspended vibrating screen. The screen may be suspended from any simple framework or from the ceiling, and coil spring shock absorbers prevent transmission of the vibration to the supporting structure. The screen may be operated at a slight pitch or even in the horizontal position depending on the type of screening to be done. The shaking device is a standard Ajax-Shaler shaker, which utilizes the principle of offset rotating weights.

Another new piece of equipment in this booth was the Ajax vibrating packer. It consists merely of a platform mounted on coil springs with a Shaler shaker appended to the underside. A package of granular or powdered material may be placed on the platform and because of the constant high speed vibration, the material is quickly packed.

In the booth of the J. H. Day Co., Cincinnati, Ohio, was a new portable gyrating sifter. The sifter has a ½-hp. motor which shakes a screen horizontally by means of an eccentric drive. One feature of the machine is that the screen may be easily removed for cleaning; another is that a screw elevator for conducting the sifted material away is a part of the equipment. This company's Ro-Ball screen has been improved in that it can now be jacketed to provide temperature control.

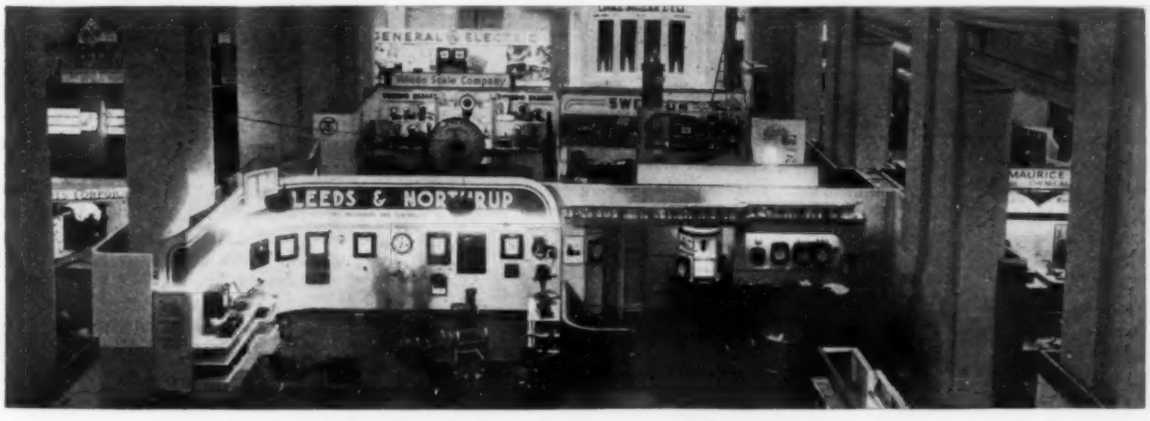
An interesting display of the Rochester Engineering & Centrifugal Div. of American Laundry Machinery Co., Cincinnati, Ohio, was a new low-headroom suspended centrifugal, with a 30-in. diameter basket. Through a modification in the drive and shortening of the spindle, the overall height of this machine has been reduced to 88¼ in. The drive is a novel two-speed type employing a single constant-speed motor. When the motor is operated forward, it drives the basket at operating speed through V-belts. When operated in the reverse direction, the motor is connected through a centrifugal clutch and gearing so as to drive the basket in the same direction as during operation, but at a reduced speed for unloading. This arrangement makes full motor power available for the unloading operation. This company also showed an improved design available in its 20 to 30 in. under-driven centrifugals. The basket of this machine is welded and has a flat bottom, an arched top ring without spun edge, and no protuberances to interfere with a filter bag. The curb of the new machine is fabricated rather than cast to permit use of any desired metal. Heavier anti-friction bearings, a single and a double bearing, are employed to support the spindle.

Latest developments in its recently designed high-speed horizontal bulk centrifugal, the Super-D-Hydrator, were shown by the Sharples Corp., Philadelphia, Pa. This machine employs high rotative speed (2,000 r.p.m.), a relatively small basket diameter (20 in.), and automatic control to attain high capacity with a machine of relatively small size. A combination of pneumatic and hydraulic control, actuated from an electrically synchronized panelboard and designed so that any part of the cycle may be altered as desired, is used to eliminate attendance. As an example of operation, the machine is stated to handle 50 lb. of byproduct ammonium sulphate on a 45-second cycle, during which the bowl is loaded, the crystals rinsed, dried and unloaded with the rotor running continuously at full speed.

This company also showed a new machine known as the Airfuge which, although developed primarily for the continuous centrifuging of airplane motor oil, appears to have industrial applications. This machine is of the disk bowl type and is driven at 6,000 r.p.m. by an oil turbine. Liberal use of magnesium to secure extremely light weight is a noteworthy feature. Probable applications include oil purification for diesel engines and for refrigeration compressors. Another new development shown was an inclosed laboratory model of Super Centrifuge developed especially for the handling of toxic materials in pharmaceutical investigation and manufacture.

Several improvements in its under-driven centrifugals were shown by the Tolhurst Centrifugal Div., American Machine & Metals, Inc., East Moline, Ill. A new construction of under-driven machines up to 30-in. diameter basket employs an integral steel casing extending from the top of the curb to the floor and hence serving also as a base. For under-driven machines of the outside-pedestal-support type, the timer, if used, may now be built integral with the top of one of the pedestals. A new laboratory under-driven machine also shown by this company, had a 12-in. basket and featured three-speed drive, using stepped pulleys and a V-belt.

An improved mechanically operated vibrating screen for low-angle operation, known as the Ty-Rock, was exhibited by the W. S. Tyler Co., Cleveland, Ohio. This screen, which is available for both wet screening and dry operation, features a full-floating eccentric shaft and vibration-insulating mountings. A circle-throw motion is imparted. The eccentric shaft is carried on arms supported on live rubber mountings. These mountings permit the shaft to revolve about its own natural center of rotation and are therefore said to prevent any vibration whatever from being imparted to the foundation. The screen itself is also supported on rubber mountings.



Chemical Engineer's BOOKSHELF

New Titles, Editions and Authors

INDUSTRIAL SOLVENTS. By *Ibert Mellan.* Published by Reinhold Publishing Corp., New York, N. Y. 480 pages. Price $11.

Reviewed by *L. B. Pope*

DATA on industrial solvents are widely scattered throughout the literature and buried deep in the files of various manufacturers. It was the author's apparent intention to bring together into this one volume as much as possible of the published or otherwise available material relating in any way to industrial solvents. Following this idea, he has devoted the first chapter to a discussion of theories of solution and the last chapter to graphical expression and interpretation.

The main part of the text has been divided into two parts, each giving a different method of presentation. First, the different chemicals have been grouped and discussed according to properties such as viscosity, vapor pressure, toxicity and so forth. The other grouping is by chemical composition: hydrocarbons, halogenated hydrocarbons, alcohols, aldehydes, acids, ketones, ethers, esters and plasticizers. While this system necessarily means some duplication of data, it also facilitates location of desired information and permits easy comparison of various properties.

SPECTROSCOPY

WAVELENGTH TABLES. By *George R. Harrison.* Published by John Wiley & Sons, Inc., New York, N. Y. 429 pages. Price $15.

Reviewed by *E. Henning*

DR. HARRISON and his collaborators have herewith recorded the wavelengths of 85 of the elements. These wavelengths range from 10,000 to 2,000 A. The charts are arranged according to elements as well as in order of their decreasing wavelengths. They show an accuracy of 10^{-2} to 10^{-3} A, with an intensity range of from 1 to 9,000. Arc, spark and discharge tube spectra as well as airlines and bandheads are all given adequate treatment. A most satisfactory arrangement is the special table dealing with the most sensitive lines of these 85 elements.

The author, a professor at M. I. T., is well known in his field. He was ably assisted in preparing this book by some of his co-workers at M. I. T. as well as a W. P. A. group. Since the *Handbuch der Spectroskopie* by H. Kayser and associates appeared some little time back, there has been no book published which presented this wavelength material so comprehensively and completely. Moreover, Harrison confines his work largely to his own data. Only about one fourth of the entire material is taken from the literature. This makes for great uniformity of information. Of 109,275 entries only 432 disagree with similar entries in Kayser's book. This is less than 0.3%. Of the total 429 pages, only a few are devoted to introduction and necessary details and explanations, the other more than four hundred present only the graphic material. The introductory materials include data on bibliography, symbols, apparatus, technique and sources of error. The work as a whole is an indispensable tool for the spectroscopist and merits high praise.

RECENTLY OFF THE PRESS

THE DECLINE OF MECHANISM IN MODERN PHYSICS. By *A. D'Abro.* Published by D. Van Nostrand Co., Inc., New York, N. Y. 982 pages. Price $10.

THE FIRST PART of this book is a survey of the history of physics including background information in mathematics and philosophy as well as in physics. The last section of the book deals with modern theories, namely those of relativity and the quantum theory. The book is historical and philosophical rather than practical. In view of the fact that the authors give a complete and careful mathematical background for each subject, the intelligent lay reader should have no difficulty in following this text.

MODERN BLAST CLEANING AND VENTILATION. By *C. A. Reams.* Published by The Penton Publishing Co., Cleveland, Ohio. 213 pages. Price $4.

A COMPREHENSIVE HANDBOOK covering the entire field of blast cleaning and its allied equipment including a history of this art.

THE OPEN-HEARTH FURNACE. Vol. III. By *William C. Buell, Jr.* Published by The Penton Publishing Co., Cleveland, Ohio. 308 pages. Price $4.

VOLUME III on the open-hearth furnace deals with the components of the furnace system located below the charging floor, slag pockets, fantails, regenerators and the flues. The work includes much economic as well as scientific data.

ENGINEERING PHYSICAL METALLURGY. By *Robert H. Heyer.* Published by D. Van Nostrand Co., Inc., New York, N. Y. 549 pages. Price $4.50.

AN ATTEMPT to condense, correlate and bring up to date the various materials, methods and concepts of metals technology is made in this volume designed for those making their first acquaintance with engineering metals and alloys as well as for non-metallurgical students.

PRINCIPLES OF METALLOGRAPHY. Fourth Edition. By *Robert S. Williams* and *Victor O. Homerberg.* Published by McGraw-Hill Book Co., Inc., New York, N. Y. 339 pages. Price $3.50.

THE PURPOSE of this book is to give the reader the fundamentals of physical metallurgy. Several new chapters have been added to the previous edition to bring it up to date. Many of the newer applications of metallography have been included.

MOTION PICTURE SOUND ENGINEERING. A series of lectures of the Research Council of the Academy of Motion Picture Arts and Sciences. Published by D. Van Nostrand Co., Inc., New York, N. Y. 547 pages. Price $6.

DEVELOPMENT OF EQUIPMENT and technique for recording sound for the motion picture is presented in this book which covers current sound recording and sound reproducing practice.

TEXT BOOKS

GENERAL CHEMISTRY. Third Edition. By *T. P. McCutcheon, Harry Seltz* and *J. C. Warner.* Published by D. Van Nostrand Co, Inc., New York, N. Y. 685 pages. Price $3.75.

THIS TEXT is designed primarily for use in first-year college chemistry courses. Recognizing the modern emphasis on organic chemistry the authors have added several chapters on general organic chemistry and applied organic chemistry including foods and nutrition.

A LABORATORY COURSE IN GENERAL CHEMISTRY. Second Edition. By *G. L. Carter* and *J. W. Cole.* Published by D. Van Nostrand Co., Inc., New York, N. Y. 225 pages. Price $2.

A GENERAL LABORATORY book for the first year college student, this work may be used satisfactorily for the liberal arts student as well as the scientific one.

COLLOID CHEMISTRY. By *Harry B. Weiser.* Published by John Wiley & Sons, Inc. New York, N. Y. 428 pages. Price $4.

THIS ADVANCED TEXTBOOK presupposes a knowledge of physical chemistry and is primarily intended for students specializing in chemistry or chemical engineering. The threefold purpose of the book is to lay the foundations of colloid chemistry, to formulate and correlate theories underlying colloidal behavior and finally, to illustrate the industrial applications of the subject.

PHYSICO CHEMICAL EXPERIMENTS. By *Robert Livingston.* Published by The Macmillan Co., New York, N. Y. 257 pages. Price $2.

THIS IS A LABORATORY course in physical chemistry illustrating the basic principles of the subject. Computing methods and the theory of errors and measurements are included. It is a general undergraduate text.

QUANTITATIVE CHEMICAL ANALYSIS. Seventh Edition. By *A. C. Cummings* and *S. A. Kay.* Published by D. Van Nostrand Co., Inc., New York, N. Y. 496 pages. Price $5.

THIS NEW EDITION, brought entirely up to date, gives the latest advances in each field of analysis. The section on organic chemistry, included in the earlier editions, has been omitted to make room for additional methods. Modern organic chemistry is of such a scope that it requires individual treatment impossible to include in a single volume of this sort. This text still maintains the principal features which have made it popular for so many years.

QUALITATIVE ORGANIC CHEMISTRY. By *Neil Campbell.* Published by D. Van Nostrand Co., Inc., New York, N. Y. 213 pages. Price $2.60.

ALL THE BASIC and up-to-date facts of organic analysis are presented in this concise reference. It is of pocket size although it covers determination of properties, preparation of derivatives and interpretations of final results. Many diagrams and data tables are included.

SEMIMICRO QUALITATIVE ANALYSIS. By *A. R. Middleton* and *J. W. Willard.* Published by Prentice-Hall, Inc., New York, N. Y. 446 pages. Price $3.50.

NUMEROUS ADVANTAGES of using semimicro amounts of material in qualitative analysis are generally recognized. This text gives remarkably accurate and reliable procedures. Many new views in the field of chemistry are included, but in a manner completely within the limited knowledge of the beginning student.

GOVERNMENT PUBLICATIONS

Documents are available at prices indicated from Superintendent of Documents, Government Printing Office, Washington, D. C. Send cash or money order; stamps and personal checks not accepted. When no price is indicated pamphlet is free and should be ordered from bureau responsible for its issue.

Motor Carrier Safety Regulations, Revised. Indicates regulations about drivers, operators, equipment, accident reports, etc., for contract and common carrier trucks, and under certain circumstances to privately owned trucks in interstate commerce. Interstate Commerce Commission; 20 cents.

The Causes and Prevention of Wood Alcohol Poisoning. Department of Labor, Industrial Health Series No. 10; 5 cents.

The Causes and Prevention of Poisoning by Chlorinated Solvents. Department of Labor, Industrial Health Series No. 11; 5 cents.

The Causes and Prevention of Injury from Acids and Alkalies. Department of Labor, Industrial Health Series No. 18; 5 cents.

Fluorides in Food and Drinking Water, by F. J. McClure. U. S. Public Health Service, National Institute of Health Bulletin No. 172; 15 cents.

Use of Alcohol from Farm Products in Motor Fuel. Hearings before Senate Subcommittee on Finance, 76th Congress, 1st session; 25 cents.

Instructions for Painting and Cementing Vessels of the United States Navy. Applies to metal work with marine exposure. Navy Department, General Specifications—Appendix 6 (Edition of April 1939); 15 cents.

Summary Report of Research at the National Bureau of Standards on the Stability and Preservation of Records on Photographic Film, by B. W. Scribner. National Bureau of Standards, Miscellaneous Publication M162; 10 cents.

Standards and Specifications for Building and Construction Materials, Fixtures, Supplies, and Equipment. National Bureau of Standards, Letter Circular 570; mimeographed.

Biennial Census of Manufactures, 1937, Part II. Gives statistics regarding the manufacturing of goods arranged by states and cities of 25,000 or more. Bureau of the Census; 60 cents.

Clay Census. Two releases issued by the Census Bureau on annual census for: Clay Products, other than pottery; and Pottery including porcelain ware; mimeographed.

The Balance of International Payments of the United States in 1938. Bureau of Foreign and Domestic Commerce, Economic Series No. 5; 15 cents.

Distribution Cost Accounting for Wholesaling, by H. F. Taggart. Bureau of Foreign and Domestic Commerce, Domestic Commerce Series No. 106; 15 cents.

The United States in India's Trade, by Charles K. Moser, Bureau of Foreign and Domestic Commerce, Trade Promotion Series No. 200; 20 cents.

Transport Control Abroad, by W. Rodney Long. Bureau of Foreign and Domestic Commerce, Trade Promotion Series No. 196; 40 cents.

World Trade in Dental and Surgical Goods, by George R. Donnelly. Bureau of Foreign and Domestic Commerce, Trade Promotion Series No. 204; 25 cents.

Toxicity of Certain Organic Insecticides to Codling Moth Larvae in Laboratory Tests, by E. H. Siegler, F. Munger, and L. E. Smith. Department of Agriculture, Circular No. 523; 5 cents.

The Use of Methyl Bromide for the Treatment of Quarantined Plant Products, by Lon A. Hawkins. Bureau of Entomology and Plant Quarantine, E-484; processed.

Geology and Coal Resources of the Minot Region, North Dakota, by David A. Andrews. U. S. Geological Survey, Bulletin 906-B; 50 cents.

Summary of Ground-Water Conditions and Resources, Utilization of Water from Wells and Springs, Methods of Scientific Investigation, and Literature Relating to the Subject, by Oscar Edward Meinzer. U. S. Geological Survey, Water-Supply Paper 836-D; 15 cents.

Areal Geology of Alaska, by Philip S. Smith. U. S. Geological Survey, Professional Paper 192; $1.25 (paper).

The Problem of Alaskan Development. Report to the Secretary of Interior. Department of Interior; mimeographed.

Friability, Slacking Characteristics, and Low-Temperature Carbonization Assays of Subbituminous Coals of the Denver (Colo.) Region, by V. F. Parry and John B. Goodman. Bureau of Mines, Report of Investigations 3457; mimeographed.

Physical and chemical properties of cokes made or used in Washington, by H. F. Yancey, R. E. Zane, R. W. Fatzinger, and J. A. Key. Bureau of Mines, Technical Paper 597; 10 cents.

Practices and Methods of Preventing and Treating Crude-Oil Emulsions, by G. B. Shea. Bureau of Mines, Bulletin 417; 30 cents.

Monthly surveys of strategic minerals. The Bureau of Mines has recently initiated a series of reports, giving monthly statistics on production and stocks of strategic minerals. The first of these, Mineral Market Report M.M.S. No. 767, gives data on mercury for September, 1939.

Reservoir Characteristics of the Eunice Oil Field, Lea County, N. Mex., by C. C. Anderson, H. H. Hinson, and H. J. Schroeder, Bureau of Mines, Report of Investigations 3456; mimeographed.

Annual Report of the Explosives Division, Fiscal Year 1938, by Wilbert J. Huff. Bureau of Mines, Report of Investigations 3454; mimeographed.

Active List of Permissible Explosives and Blasting Devices Approved Prior to June 30, 1939. Bureau of Mines, Report of Investigations 3471; mimeographed.

Production of Explosives in the United States, During the Calendar Year 1938, by W. W. Adams, V. E. Wrenn, and L. S. Horton. Bureau of Mines, Technical Paper 606; 5 cents.

Annual Report of the Mining Division, Fiscal Year 1939, by Charles F. Jackson. Bureau of Mines, Report of Investigations 3470; mimeographed.

Investigation of Electrical Equipment, Safety Lamps, and Gas Detectors for Safety, by L. C. Ilsley. Bureau of Mines, Information Circular 7087; mimeographed.

Oxidation of Carbon Monoxide and Hydrogen by Bacteria, by G. W. Jones and G. S. Scott. Bureau of Mines, Report of Investigations 3466; mimeographed.

Properties of Suspension Media for Float-and-Sink Concentration, by F. D. DeVaney and S. M. Shelton. Bureau of Mines, Report of Investigations 3469; mimeographed.

Energy Resources and National Policy. National Resources Committee; $1.00.

The Structure of the American Economy, Part I. Basic Characteristics. National Resources Committee; $1.00.

Wages and Hours in Drugs and Medicines and in Certain Toilet Preparations, by Arthur T. Sutherland. Department of Labor, Women's Bureau Bulletin No. 171; 10 cents.

Annual Report of the Nonmetals Division, Fiscal Year, 1939, by Oliver C. Ralston. Bureau of Mines, Report of Investigations 3473; mimeographed.

Nomographic Chart for Temperature Correction of Aqua Ammonia Densities, With Additional Scales for Interconversion of Physical Data

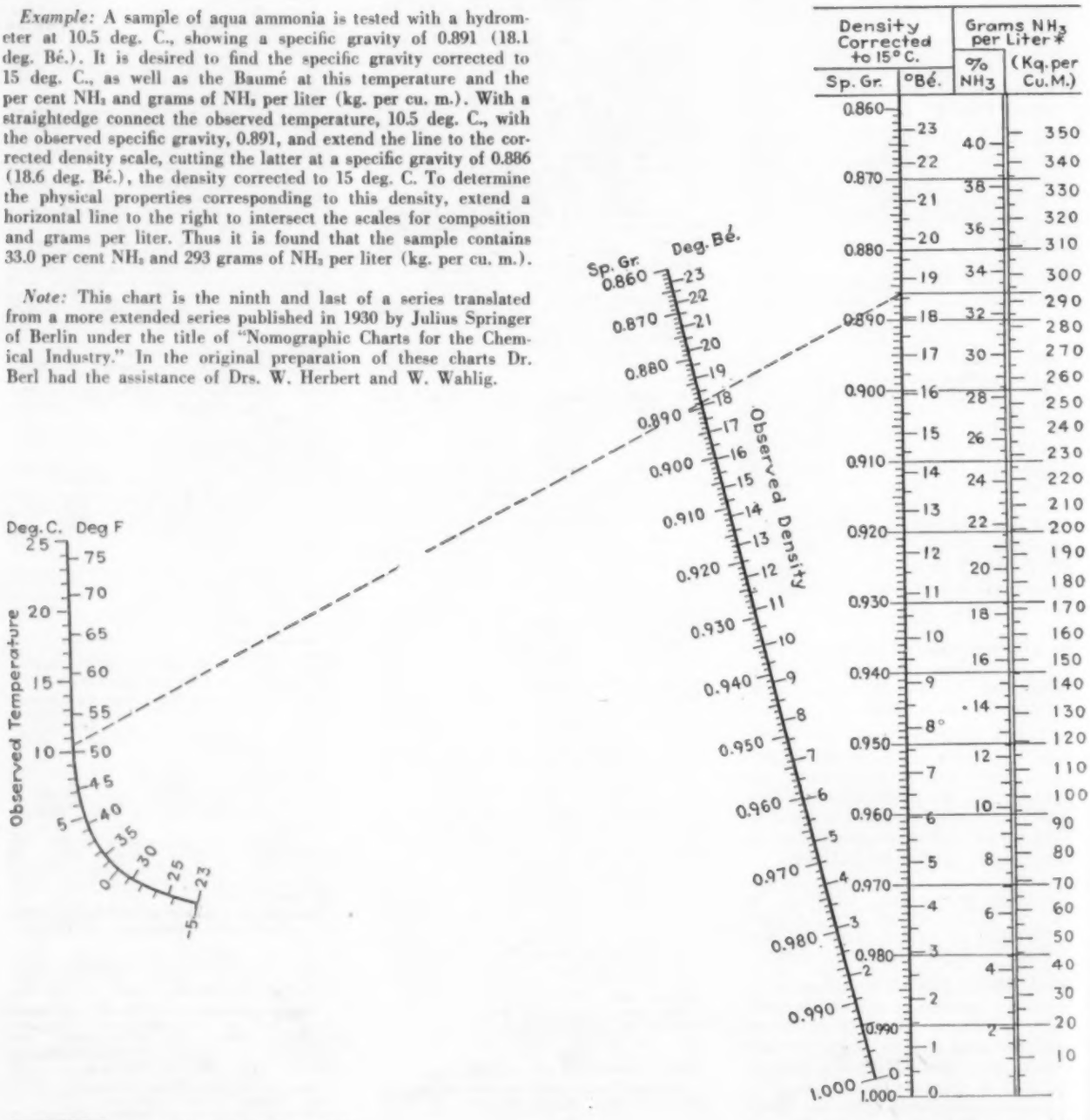
By ERNST BERL

Research Professor
Carnegie Institute of Technology
Pittsburgh, Pa.

Chart IX

Example: A sample of aqua ammonia is tested with a hydrometer at 10.5 deg. C., showing a specific gravity of 0.891 (18.1 deg. Bé.). It is desired to find the specific gravity corrected to 15 deg. C., as well as the Baumé at this temperature and the per cent NH_3 and grams of NH_3 per liter (kg. per cu. m.). With a straightedge connect the observed temperature, 10.5 deg. C., with the observed specific gravity, 0.891, and extend the line to the corrected density scale, cutting the latter at a specific gravity of 0.886 (18.6 deg. Bé.), the density corrected to 15 deg. C. To determine the physical properties corresponding to this density, extend a horizontal line to the right to intersect the scales for composition and grams per liter. Thus it is found that the sample contains 33.0 per cent NH_3 and 293 grams of NH_3 per liter (kg. per cu. m.).

Note: This chart is the ninth and last of a series translated from a more extended series published in 1930 by Julius Springer of Berlin under the title of "Nomographic Charts for the Chemical Industry." In the original preparation of these charts Dr. Berl had the assistance of Drs. W. Herbert and W. Wahlig.



* For pounds per cubic foot divide by 16.02.

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Process Equipment NEWS

Machinery, Materials and Products

Liquid-Gas Contactor

A NEW DEVICE known as the Stationary Disintegrator has been developed by the H. A. Brassert Co., 310 South Michigan Ave., Chicago, Ill., for a wide variety of contacting operations between liquids and gases or vapors, for the purpose of absorption, washing and scrubbing, reaction, heat transfer and fractionation. This consists primarily of a venturi tube through which a fine spray of the liquid is jetted at high velocity, thereupon impinging upon a deflector plate set at right angles to the direction of flow. The effect of the spray is to induce a concurrent flow of the gas or vapor with which contact is to be achieved. The standard rating is one Disintegrator for each 1,000 c.f.m. of gas (at standard conditions) which is to be treated.

As will be seen from the accompanying illustration the venturi ("velocity chamber") may be adjusted with respect to the position of the deflector plate baffle from outside the contacting chamber. Furthermore, the nozzle may be removed for examination or replacement without disturbing the operation of other disintegrators in the apparatus. Thus ready adjustment of the back pressure and velocity of the gas can be made for best results, even when a change in operating conditions is entailed. And although clogging is said to be unlikely, cleaning can be accomplished with a minimum of disturbance.

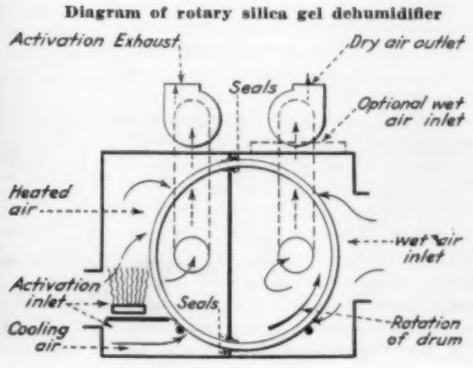
Stationary Disintegrator for gas-liquid contacting

Silica Gel Dehumidifier

A ROTARY DESIGN of silica gel dehumidifier which is now made in capacities of 500 and 1,300 c.f.m. (and will shortly be available also in 900 and 2,500 c.f.m. models) has been developed by the Bryant Heater Co., 17825 St. Clair Ave., Cleveland, Ohio. With this machine moisture is removed from the air passing through by adsorption by silica gel and condensation within the pores of this material. The latent heat so released is transferred to the air and subsequently removed by surface coolers. Humidity may thus be reduced without resort to low temperature cooling. Customarily the silica gel is re-activated by the use of gas fuel, although for industrial work the unit may be arranged for steam activation, using steam at 100 lb. gage pressure, or higher.

The silica gel is carried in a cylindrical basket made up of two concentric cylinders of wire mesh screen. As shown in the accompanying cross section the silica gel drum is supported on two horizontal shafts and driven by a motor, so as to rotate in 7 to 9 minutes, depending on the size of the unit. The drum is enclosed in a casing and provided with a vertical partition and a number of seals to separate the circulating air side from the activation air side. Humid air drawn through the ¾ in. thickness of silica gel is dehumidified to a moisture content depending on the moisture content and temperature of the entering air. The saturated gel is then rotated past the seal at the top to the activation chamber where heated air is drawn through to dry it, followed by cool air to remove the sensible heat of the gel. The moisture so removed is then exhausted with the activation air outside the space being conditioned, while the dehumidified air is passed over surface cooling coils to remove the heat of moisture condensation.

Diagram of rotary silica gel dehumidifier



These units are supplied complete with fans, motors, gas burner and necessary controls. In normal operation pressures in the two chambers are adjusted so that the small amount of leakage through the seals is toward the activation side, so that provision must be made to admit a small amount of outside air into the conditioned space.

Equipment Briefs

CARRIER CORP., Syracuse, N. Y., has announced a new line of gas-fired unit heaters made in suspended, duct and floor units. Four capacities are available, except in the duct feeder line which includes a range of six capacities. A maximum heating efficiency and quiet operation resulting from the slow speed rubber-mounted fan motor are features of the new design.

SOME TIME AGO the Hays Corp., Michigan City, Ind., announced a new automatic flue gas analyzer known as the Orsatomat which accomplishes analysis of flue gases by the Orsat principle in practically automatic fashion. At the time of the Power Show in 1938, this instrument was exhibited in a considerably improved and modified form. This new form has been put on a production basis and is now on the market. The principal change, aside from making the new instrument smaller, lighter in weight and more compact, is to construct the tilting analyzing unit of transparent Lucite instead of the hard rubber formerly used. All measuring and absorption of CO_2 is done automatically through the ingenious use of mercury. All that the operator needs to do to obtain an accurate analysis of a sample of combustion gas is to pull out a small rod projecting from the inside of the case, aspirate the gas into

the unit by means of a rubber bulb and push in the rod, whereupon the percentage is instantly indicated on a dial.

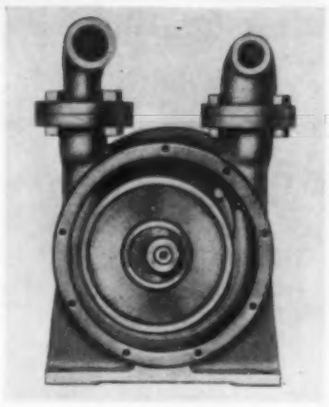
A NEW VAPOR-PROOF and water-proof flashlight for use in service where an ordinary flashlight might initiate an explosion, has been announced by the Stewart R. Browne Mfg. Co., 258 Broadway, New York, N. Y. The entire case is made of a durable plastic developed by this company which is said to be tough and resistant to oils, acids and most chemicals. It is claimed that the flashlight can be submerged under water indefinitely without effect on its operation.

CHICAGO METAL HOSE CORP., Maywood, Ill., has recently developed a method of attaching metal end fittings and end seals to metallic tubing by means of electric resistance welding. The method is designed principally for use with stainless steel tubing and with stainless steel bellows whereby completely vacuum-tight units can be produced, free from soldered, brazed or torch-welded joints of any kind. The end fittings are secured by circumferential seam welding which is said to have been made possible through the development of specialized equipment operating automatically and eliminating the human element entirely. Thin metal gages and metals of unlike thickness or unlike analysis can be readily joined.

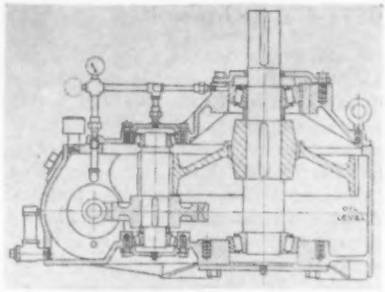
A RECENT DEVELOPMENT of United Chromium, Inc., 51 East 42d St., New York, N. Y., is Unichrome Rack Coating-W, a new rack coating material for plating racks of all descriptions. The material is said not to be affected by boiling cleaners or plating solutions in general use, including chromium. It is further stated to contain no ingredients which are in any way harmful to any plating bath into which these coated racks can be introduced. The manufacturer states that many racks coated with this material have stood up without signs of deterioration during continuous use for a period of months.

Rubber Tube Pump

A PUMP which employs only rubber or neoprene tubing in contact with the material being handled has been developed and announced by the Huber Pump Co., 90 West St., New York, N. Y. For handling corrosive or abrasive liquids of all kinds, the new pump features a type of construction which is said to eliminate all ordinary types of pump troubles. For example, there are no valves, no stuffing box, and no moving parts in contact with the material. Essentially the pump consists of a cylindrical casing within which is a rubber or neoprene tube—as determined by the requirements of the material being handled. This tube is forced in contact with the casing by an eccentric rotor revolving within a



Rubber or neoprene tube pump

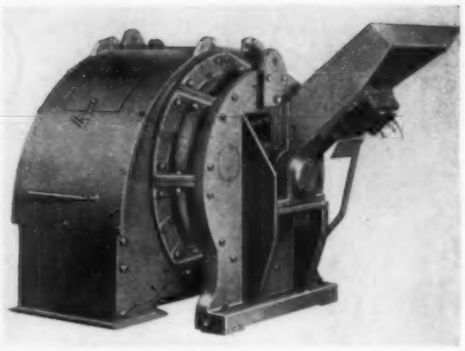


Vertical shaft reducer

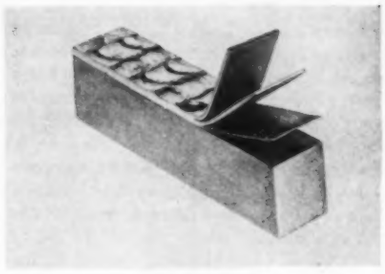
cylindrical compressor ring which itself moves eccentrically but without rotation. The adjustment of the compressor ring is such that as it progresses around the periphery of the tube, it forces the latter completely closed. The tube, however, has a heavy wall of elastic construction so that as soon as released by the rotor, it springs back to cylindrical cross section, thus creating a high vacuum, and drawing liquid into the tube. As the rotation continues the liquid previously trapped in the tube is forced ahead by the movement of the rotor, with liquid flowing in behind the rotor as previously explained, ready for the next revolution of the eccentric.

Dual Screen Grinder

A COMPLETE new series of dual screen grinders for high-production grinding of chemicals and industrial materials has been announced by the Prater Pulverizer Co., 1801 South 55th Ave., Chicago, Ill. Dual screens are provided, covering 70 per cent of the drum area. Feed to the mill is from the side of the rotor, the material being passed successively through three stages, a series of breaker bars, triangular pivoting crushers, and a final series of special alloy steel hammers. An increasing diameter of rotor through the three stages increases the travel speed of the grinding elements in each phase. Through selection of the type of crushing elements employed in the last stage, almost any degree of reduction can be



Dual-screen triple-reduction grinder



Croloy bonded plate showing veneered construction

secured, according to the manufacturer.

Advantages claimed for the new machine include high capacity and a high degree of control over grain size and granulation. Easy screen changes are possible for various finished sizes. Low power consumption owing to relatively low rotational speed and to the use of self-aligning, dust-sealed ball bearings, is also claimed.

Vertical Shaft Reducers

A NEW LINE of worm-helical speed reducers developed for vertical shaft drives for agitators, mixers and similar equipment, where a large reduction in speed is required, has been announced by the W. A. Jones Foundry & Machine Co., 4401 Roosevelt Road, Chicago, Ill. The new line is available in 15 standard ratios ranging from about 40 to 1 to approximately 250 to 1, for all common motor speeds and horsepower ratings. These reducers are of rugged design, provided with large radiation areas and large oil reservoirs, each reducer being supplied with an oil pump for lubricating both bearings and gears. Various types are available, for drive from either side, and with the vertical shaft extending either upward or downward or both.

Welded Ply-Metal

AN INTERESTING type of ply-metal known as B & W Croloy Bond Plate has recently been announced by the Babcock & Wilcox Co., 85 Liberty St., New York, N. Y. The plate consists of two or more thin layers of chromium alloy perman-

ently bonded by overlapping electric resistance welds to the base plate of carbon or carbon-molybdenum steel over the entire surface. The new plate is said to offer advantages in resistance to failure resulting from repeated heating and cooling, retaining all advantages of this type of plate after undergoing the usual fabricating operations. The accompanying illustration shows a coupon of this bonded plate with an alloy veneer of two thin rolled sheets of chromium alloy bonded to a carbon steel base with a sheet of nickel between.

Diaphragm Reducing Valves

TWO NEW IMPROVED direct-mounted reducing valves have been announced by the Fisher Governor Co., Marshalltown, Ia. The valves are without stuffing boxes, for use where packing would be objectionable. Applications on steam, air, gas lines are recommended by the maker. Type 217AS is a spring actuated valve, while Type 217AL is designed for lever and weight operation. Both valves have full capacity bodies with double disk, ground bevel seat and balanced inner valves. Simplified design without dash pots or pistons is said to increase operating life and lower maintenance costs. These valves are available for pressures to 100 lb., in sizes from ½ to 8 in. pipe size.

Diesel-Driven Welder

A NEW 300-amp. diesel-engine-driven arc welder, provided with a gasoline engine for starting, has been announced by the Lincoln Electric Co., Cleveland, Ohio. This method of starting is said to afford advantages as compared with the conventional motor starter and storage batteries. The gasoline engine itself is started by means of a hand crank and this engine is belt-connected to the diesel by means of a clutch. Cold-weather starting is facilitated by connecting the cooling system of the gasoline engine to that of the diesel. A reduction in fuel cost of 33-86 per cent as compared with gasoline operation is claimed for this welder, depending on the type of fuel oil used. The welder is this company's "Shield Arc S.A.E." unit equipped with dual continuous control.

Photocell Relay

A NEW LINE of photoelectric control relays available in a considerable range of types for high-speed industrial control operations at ranges of 20 and 100 ft., depending on the model, has been announced by Photoswitch, Inc., 21 Chestnut St., Cambridge, Mass. These relays are provided with weatherproof housings and are available for a.c. or d.c. supply. A conservative life rating for the vacuum tube employed is stated to be 2,000 hours. No adjustment or replacement other than normal replacement of the vacuum tube and lamp in the light-source is required, according to the manufacturer. Relays of this type are available for counting, smoke and fume detection, and a variety of control applications. Photoswitches normally are provided with a relay capable of operating a signal, control or alarm up to 100 watts. If control of a heavier current is desired, a power relay may be used.

Small Motor Starter

FOR THE STARTING of motors in sizes to 2 hp. polyphase, or 1½ hp. single-phase at 220 volts, the Square D Co., Milwaukee, Wis., has announced a small automatic starter designated as Size O, Type R, Class 8536. This starter has a vertically operating magnet, double-break silver contact and thermal overload relay. It is offered for general purpose, dust-tight, water-tight, or Class II, Group G service and also in the form of a combination starter with either disconnect switch, circuit breaker, or reversing arrangement.

New Products

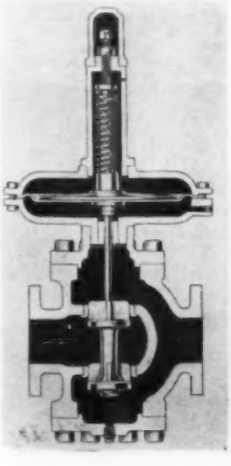
A NEW one-coat, one-fire brown porcelain enamel finish, which is said to be especially useful on lighter gage metals, has been announced by the Porcelain Enamel & Mfg. Co., Baltimore, Md. It is claimed that a much lower firing temperature is required than is ordinarily needed to obtain a good bond. The new enamel is said to cover uniformly and completely and to have a good glossy finish.

MAR-NEL CHEMICALS, Detroit, Mich. has announced Galv-A-Niel, a quick and reportedly economical treatment for preparing zinc, zinc alloys and galvanized materials to assure adhesion of paint films. The treatment is said to be equally effective for new or old zinc or zinc-coated surfaces. It is explained that zinc tends to react with the drying oils in paint, producing brittle solids which peel within a short time. One application of the new material is the only treatment required, no special primers or paints being needed. Furthermore, no special equipment is required for application. The effect of the new material is to build up a surface film which, according to the manufacturer, produces a perfect bond for the paint.

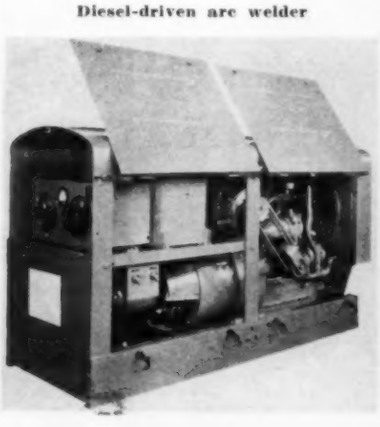
A READY-MIXED aluminum paint containing base oils of the penetrating type, which creep into all joints and contact points, has been developed by the Skybryte Co., Cleveland, Ohio, especially for the painting of rusted chain-link fencing without removing the rust. It is claimed that the new paint, Fence-Bond, seals the rust against further corrosive action and retains a firm elasticity which is able to withstand the movement of the joints without chipping. Either brush or spray gun application is suitable.

FOR EXTERNAL APPLICATION to metal surfaces for protection against corrosion, D. W. Haering & Co., 2308 South Winchester Ave., Chicago, Ill., has developed a new line of coatings containing chrome glucosate compounds for corrosion control, and identified by the trade name of In-Hib-Co. These products, available in several forms for varying temperature requirements, may be applied by brushing, spreading or spraying on exposed surfaces, are claimed to resist moisture and to contain suffi-

Direct mounted reducing valve

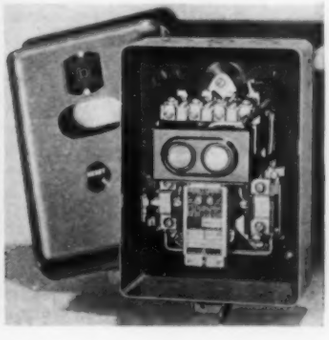


Diesel-driven arc welder



New photocell relay

Small motor starter



cient film inhibitor to protect underlying surfaces from corrosion for an indeterminate period of time. It is claimed that 1 lb. of the average product covers 1,000 sq.ft.

A NEW pre-mixed floor-resurfacing material claimed to bond permanently to concrete, metal, wood or mastic floors, and to be suitable for thicknesses from ⅛ in. to a feather edge, has been announced by the Rock-Tred Co., 629 West Washington St., Chicago, Ill. A minimum of preparation is required and the material is said to cure in 8 to 12 hours, becoming harder with age and use. The gum-like structure of the material is claimed to give lasting resilience and to assure dustless, noiseless and sparkless features. Heat and fire resistance and non-conduction of electricity are claims.

AUTOVENT FAN & BLOWER CO., 1805 North Kostner Ave., Chicago, Ill., has recently announced the use of Heresite as an acid- and moisture-proof coating on its propeller fans for acid-moisture-proof and vapor-explosion-proof service. This material is stated to resist practically all metal-corroding substances.

Small Linestarter

A SMALL, inexpensive across-the-line starter for use in starting squirrel-cage induction motors and as a primary switch for wound-rotor induction motors has been announced by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. The new starter is available in ratings up to 2 hp. at 220, 440 and 550 volts, two- and three-phase (or equivalent ratings on single-phase). Conveyors and pumps are typical applications. The new starters are built as plain across-the-line starters or in combination with motor circuit switches and Nofuze circuit breakers. De-ion arc quenching and snap action bi-metal disk overload relays are principal features of the design.

Another new development of this company is a compact air circuit breaker about one-half the size of previous designs of the same rating. Available in five sizes for operating currents from 15 to 6,000 amp. at 600 volts, a.c., the new breaker employs a De-ion arc chamber to minimize noise and flash, and interrupt the arcing current in one-half cycle. Moving parts are reduced to a minimum and no carbon is used for contacts.

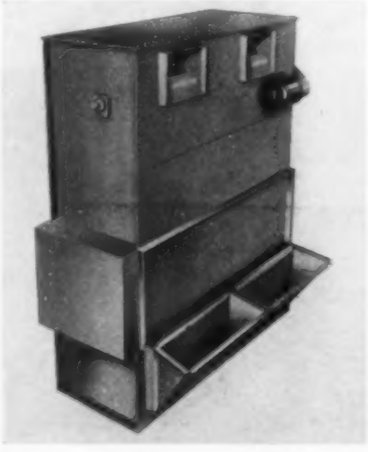
Evaporative Cooler

A NEW DESIGN of evaporative cooler for the cooling of water or other liquids in a closed circuit has recently been announced by the Trane Co., La Crosse, Wis. The new unit is particularly recommended by the manufacturer for the cooling of diesel engine jacket water or of dehumidifying liquids, as well as process liquids in cases where cooling water is scarce or expensive. In common with other evaporative coolers the Trane model employs the principle of transfer of the heat of the material to be cooled, which circulates through a coil, to recirculating water which itself is cooled, in part by the transfer of its sensible heat to air, and in part by the evaporation of a small part of the water to the air. In effect the cooler is a small induced-draft cooling tower in which the coil containing the liquid to be cooled replaces the usual cooling tower packing. Water recirculated by a pump is sprayed over the coil, while air drawn upward through the unit by a fan passes over the wetted coil, cooling the coil and water in the manner noted. By this method the consumption of water is claimed to be but 5 to 10 per cent of that required for continuous direct cooling. There are 12 sizes available with capacities at 70 deg. F. wet-bulb ranging from 6,750 to 81,000 B.t.u. cooling rate per minute. For these units pump motors range from ¼ to 1 hp., fan motors from ½ to 7½ hp. and make-up water consumption from 1 to 11.3 g.p.m.

Clad Metal Welding

ELIMINATION of any danger of reduction in corrosion resistance in the weld zone is the claim for a new method of welding stainless-clad steel which has recently been perfected by the Composite Steel Div. of Jessop Steel Co., 518 Green St., Washington, Pa. In the past it is stated there has been some difficulty encountered in welding stainless-clad steel owing to the admixture of mild steel with stainless in the weld zone. This is claimed often to have occurred even when stainless rods were used throughout. In the new method such admixture is stated not to occur even when a mild steel rod is used for welding the backing. The plate is first scarfed and the cladding bent down as shown in the drawing. The primary weld is then made with a stainless coated rod at the juncture of the two claddings. The plates are then turned over and the secondary weld made on the under-side of the exposed cladding, again with stainless coated rod. The final weld, joining the mild steel backing, is made with a mild steel coated rod. For the stainless welds, a rod of higher alloy content than the cladding is employed in each case. Lowest possible amperage and fastest possible welding are recommended.

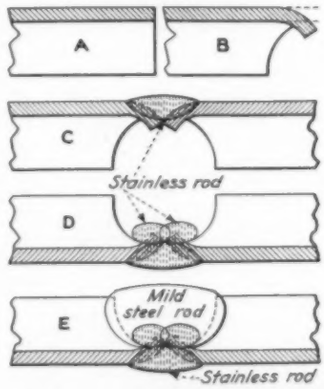
New evaporative cooler



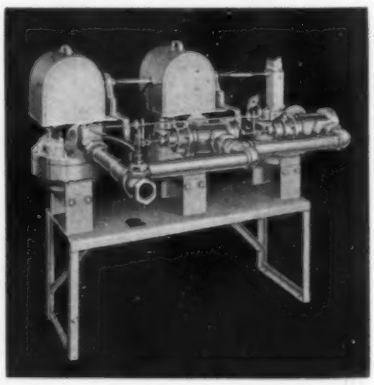
Proportioning System

A LIQUID PROPORTIONING system said to be unusually flexible has been announced by S. F. Bowser & Co., Fort Wayne, Ind., under the name of Xacto proportioning system. Available in modifications for handling two liquids to as many as five or even more, the equipment is available not only with varying numbers of meters, but also with various sizes and combinations of meters in sizes ranging from 1¼ to 3 in. The system employs this company's Xacto meters, each of which drives a proportioning mechanism which, in turn, controls the feed valve to the next meter in the series. These proportioning mechanisms are gear-operated and can be adjusted so that the next succeeding meter will deliver any proportion from ½ per cent to 100 per cent in steps of ½ per cent. Since 200 individual settings are possible between two adjacent meters, many hundreds of various formulas may be handled where three or more meters are employed. The system is claimed to save on pumping operations, power, labor and space and to eliminate extra handling.

Steps in new stainless-clad welding technique



Three-meter proportioning system



MANUFACTURERS' LATEST PUBLICATIONS

Alloys. The Duraloy Co., Scottdale, Pa.—Bulletin 3925-R—8-page bulletin dealing specifically with special alloys for oil refinery use; Bulletin 3926-G—8 pages on special alloys for industry, with information on corrosion, temperature and abrasion-resisting applications.

Apparatus. Bausch & Lomb Optical Co., Rochester, N. Y.—Catalog D-184—26-page catalog and price list on this company's microscope accessories, including objectives, eye-pieces and polarizing attachments.

Burners. Hauck Mfg. Co., 124 Tenth St., Brooklyn, N. Y.—Bulletin 405—4-page folder describing a new proportioning oil burner for manual or automatic operation, for the burning of any grade of oil.

Carburizing. Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia, Pa.—Catalog T-623—16-page bulletin describing this company's Homocarb method of carburizing.

Centrifugals. Bird Machine Co., South Walpole, Mass.—Bulletin 6—4-page case study of performance of various types of centrifugal made by this company. Four cases cover this company's underdriven, suspended, solid bowl continuous and filtering continuous centrifugals. Also 4-page bulletin describing this company's improved suspended centrifugal, redesigned for high speed operation and said to be capable of over twice the centrifugal force of most machines of this type.

Condensate Units. Roots-Connersville Blower Corp., Connersville, Ind.—Bulletin 260-B14C—6-page leaflet describing this company's automatic condensate return, make-up and boiler-feed units incorporating turbine pumps; also Form L-14E price list on this equipment.

Condensers. Ingersoll-Rand Co., 11 Broadway, New York City—Bulletin 9424—20-page bulletin describing this company's disk-flow countercurrent barometric condensers; gives much information on construction, performance and application.

Crushers. Allis-Chalmers Mfg. Co., Milwaukee, Wis.—Bulletin B6006—8-page bulletin describing in detail this company's Type R reduction crusher for fine crushing.

Crushers. Traylor Engineering & Mfg. Co., Allentown, Pa.—Bulletin 113—4 pages describing and giving performance information on this company's new Traylor-Stearns multi-stage fine reduction crusher, a new gyratory type having two concaves in series and a two-stage mantle.

Electrical Equipment. General Electric Co., Schenectady, N. Y.—GEA-2022C—14-page booklet describing Di-actor voltage regulators for alternating current generators.

Electrical Equipment. Struthers Dunn Inc., 1315 Cherry St., Philadelphia, Pa.—32-page catalog on this company's electrical control devices, containing new items and other information on relays, timing devices and thermostats.

Equipment. Alco Products Div., American Locomotive Co., 30 Church St., New York City—Bulletin 1020—4-page leaflet briefly describing a variety of pressure vessels and heat exchangers fabricated by this company. Includes charts for determining shell thickness of pressure vessels.

Equipment. American Defibrator, Inc., 405 Lexington Ave., New York City—16-page book describing the Asplund process for attaining high yield pulps from various ligno-cellulose materials by defibration in one continuous operation. This method, developed in Sweden, produces a new type of pulp by a combination of high temperature and mechanical action.

Equipment. Builders Iron Foundry, Providence, R. I.—Bulletin 311—4-page bulletin describing the range of equipment produced by this company and its associated company, Proportioneers, Inc., including meters, weight controllers and proportioning devices of various sorts.

Equipment. Downingtown Iron Works, Downingtown, Pa.—Catalog 102—42 pages on this company's steel plate fabrication, with information on the company's facilities, types of equipment fabricated, information on the A.S.M.E. unfired pressure vessel code, information on alloy steels and non-ferrous metals, and numerous tables of useful information.

Equipment. Patterson Foundry & Machine Co., East Liverpool, Ohio—Catalog 392—32 pages describing this company's pebble and ball mills in all sizes from laboratory to large production models; Catalog 395—96 pages on agitators and mixers with information on drives; also on a wide variety of kettles, kneaders, dry mixers and blenders, screens, pan mixers and thickeners.

Equipment. The Pfaudler Co., Rochester, N. Y.—24-page booklet entitled "Pfaudler's 'Test Pilots'," describing largely with pictures how this company tests its raw materials, makes its enamels, and fuses them onto glass-lined steel equipment.

Equipment. Worthington Pump & Machinery Corp., Harrison, N. J.—Publications as follows: Bulletin C-1100-B6, low pressure refrigeration units to 25 hp.; C-1100-B7, refrigeration units, 75-125 hp.; S-550-B15, vertical 4-cycle gas engines; S-550-B17, combination gas-engine-powered compressors.

Exhausters. Roots-Connersville Blower Corp., Connersville, Ind.—Bulletin 32-33-B-11—20-pages describing this company's rotary positive gas exhausters and boosters with information on construction and operating characteristics.

Filters. International Filter Co., 325 W. 25th Place, Chicago, Ill.—Bulletin 50—8 pages briefly describing this company's complete line of equipment for chemical feeding, slaking, causticizing, proportioning, measuring, mixing, thickening, washing, water conditioning and filtration.

Finishing. Binks Mfg. Co., 3114-40 Carroll Ave., Chicago, Ill.—Catalog 75—104 pages on spray painting and finishing equipment and accessories.

Grinding. Norton Co., Worcester, Mass.—Form 626—62 pages of information on grinding wheels and their selection including also cut-off wheels for non-metals. Extensive selection tables are provided.

Instruments. The Foxboro Co., Foxboro, Mass.—Bulletin 190-3—15-page booklet on this company's potentiometer recording pyrometers with detailed information on construction; also Bulletin 239, interesting 6-page booklet entitled "Foxboro and Foxboro," an informal presentation of this company's small New England town and the industry of this town, from earliest times to the present. An excellent example of industrial public relations.

Instruments. Industrial Instruments, Inc., 156 Culver Ave., Jersey City, N. J.—Leaflet describing this company's Solu-Bridge, a conductivity tester for alkali washing solutions; and conductivity bridge, an instrument for general conductivity measurements.

Instruments. Russell Electric Co., 343 West Huron St., Chicago, Ill.—Leaflet briefly describing an improved form of this company's Hold-Heet pyrometer, a portable lance type instrument for many sorts of temperature determination.

Instruments. C. J. Tagliabue Mfg. Co., Park and Nostrand Aves., Brooklyn, N. Y.—Catalog 1125C—24 pages describing this company's complete line of industrial thermometers; also hygrometers, U-gages, vacuum gages and barometers.

Lubrication. Fiske Brothers Refining Co., Newark, N. J.—4-page folder describing this company's Lubriplate lubricants for a variety of applications.

Maintenance. Porter-Cable Machine Co., Syracuse, N. Y.—Form 592—24-page booklet on floor-maintenance machinery and other power-operated tools.

Paint. B. F. Goodrich Co., Akron, Ohio—Catalog Section 9770—4-page leaflet describing this company's Acid-seal paints, a variety of rubber-base paints in black, white, colors and aluminum for protection against acids, alkalis, salt spray and moisture, as well as intermittent oil contacts.

Paint. New Jersey Zinc Co., 160 Front, New York City—Vol. 1, No. 1 of a new periodical publication "Paint Progress", containing 8 pages devoted to paint coatings in various aspects and applications.

Preheaters. Air Preheater Corp., 60 East 42d St., New York City—Form 391—20-page catalog describing in detail the Ljungström air preheater with information on advantages of preheated air, construction of the preheater in various forms, detailed information on particular construction features, and numerous methods of employing preheaters. Special types for industrial applications are described, in addition to those for power plants.

Pumps. Worthington Pump & Machinery Corp., Harrison, N. J.—Publications as follows: H-450-B29, 8 pages on turbine well pumps; H-450-B30, 4 pages on impellers for these pumps; W-321-B14, 8 pages on an improved close-coupled centrifugal pump developed by this company; W-322-B1D, 4 pages on two-stage close-coupled centrifugal pumps.

Safety. American Optical Co., Southbridge, Mass.—Bulletin featuring construction of this company's Ful-Vue goggles.

Sifters. Allis-Chalmers Mfg. Co., Milwaukee, Wis.—Leaflet 2354—6-page leaflet describing this company's improved heavy-duty gyratory sifters of the under-driven, low-head type.

Water Treatment. D. W. Haering & Co., 2308 South Winchester Ave., Chicago, Ill.—Second printing of this company's 20-page book, "The Art of Proportioning," describing the various types of "fluid piston" proportioning devices made by this company for liquid feeding. Second printing of H-O-H Lighthouse reprints, 20-page compilation of information on various water-treating problems. Third edition of "Organic Methods of Scale and Corrosion Control," 16-page technical discussion of this subject. Four page leaflet describing the new Nelson chemical proportioning pump, developed by Nelson Chemical Pump Co., Casper, Wyo., and distributed by Haering.

Welder. Allis-Chalmers Mfg. Co., Milwaukee, Wis.—Bulletin B6049—8 pages on the Weldotron, a new low current electronic welder for precision welds, particularly for thin corrosion resisting alloys.

Weighing. Builders Iron Foundry, Providence, R. I.—Bulletin 290—4-page leaflet describing the Toledo-Chronoflo continuous totalizing and proportioning conveyor scale made by this company jointly with the Toledo Scale Co.

Weighing. Toledo Scale Co., Toledo, Ohio—Brochure entitled "45,000 Ways to Weigh," showing pictorially how scales are used for a wide variety of applications, including numerous unusual uses.

Chemical Engineering NEWS

Jones Re-elected President Of A.I.Ch.E.

After an interval of 14 years, the convention of the American Institute of Chemical Engineers returned to Providence, R. I. A total registration of 335 members and guests participated in the 32nd Annual Meeting at the Providence-Biltmore, November 15–17. Fourteen companies representing such diverse industries as instruments, abrasives, silversmithing, rayon, textiles, glass, rubber, brewing, baking powder, roofings and floor coverings were hosts at plant visits.

The meeting was officially opened by William H. Vanderbilt, governor of Rhode Island, followed by messages of welcome from James F. Collins, mayor of Providence and Harold P. Arnold, president of the Providence Engineering Society.

Webster N. Jones of Pittsburgh, Pa., Dean, School of Engineering, Carnegie Institute of Technology, was reelected president. Other officers re-elected are James G. Vail, Philadelphia Quartz Co., Philadelphia, Pa., vice-president; Stephen L. Tyler of New York, secretary and executive secretary; C. R. DeLong, New York, treasurer.

The following directors were elected to serve for a term of three years each: George Granger Brown, University of Michigan; Charles R. Downs, Weiss & Downs, New York; A. B. Newman, College of the City of New York; and J. H. Perry, E. I. du Pont de Nemours & Co., Wilmington, Del.

On November 13 and 14 a National Student Chapter Meeting was held. Eighteen schools were represented at the meeting with a total registration of 117 students. The arrangements were in charge of Professor Melvin C. Molstad of the University of Pennsylvania and local arrangements were handled by the Rhode Island State Student Chapter. Professor T. Stephen Crawford was chairman of the local committee. A number of plant trips were made on both Monday and Tuesday. At a banquet held on Monday evening, Professor F. Alexander Magoun of M. I. T. gave the principal talk. On Tuesday afternoon talks were given by A. C. Chick and also by Professor Walter G. Whitman. A feature of the meeting was the series of round table discussions on process and plant development and also on plant operation. The group leaders who led the discussions were J. J. Healy, Jr., Howard Nason, C. S. Comstock and J. C. Einan and Roy Elliott, all of the Monsanto Chemical Co.; K. E. Bell of the A. C. Lawrence Leather Co.; M. H. Zimmerman of the Narragansett Brewing Co.; J. N. Junkins of the T. V. A.

Raymond Stevens Will Head Survey of Research

The appointment of Raymond Stevens, vice-president of Arthur D. Little, Inc., of Cambridge, Mass., as director of a nation-wide survey of research in industry which is to be started at once, has been announced by Dr. Ross G. Harrison, chairman of the National Research Council. The announcement followed the first meeting of a special committee held at the Engineers' Club in New York to formulate initial plans.

In announcing Mr. Stevens' appointment, Dr. Harrison stated that while funds for the work had been made available by the National Resources Planning Board, of which Frederic A. Delano is chairman, the survey would be conducted and the report prepared by the National Research Council, in accordance with plans approved by an advisory committee of leading scientists, industrial research directors and executives.

Dr. Harrison said that the report will be submitted in printed form by the Council next year and would present an objective study of industrial research as a national resource, as a means of aiding in its further development and utilization.

Gas Industry Develops Plans For Research Unit

A research institute is planned by the membership of American Gas Association to do fundamental research for both the natural gas and manufactured gas divisions of that important public utility business. Although A.G.A. takes the leadership in this movement, announced at its recent convention, the plan contemplates an independently financed organization for which an annual budget of $100,000 is proposed. The new agency will be known as the "Research Institute of the Natural and Manufactured Gas Industry".

This important proposal was made at the recent convention by a special committee on fundamental research which has served during the past six months under the chairmanship of Frank C. Smith, president of the Houston National Gas Co. Mr. Smith and his associates have been diligent in their seeking of advice and criticism from those actually experienced in industrial research. This proposal of an independent agency to work on the fundamentals needed for advancement of the gas business is the result.

The primary hope is, of course, new uses for gas as a fuel. But large attention will be given also to byproduct and corollary chemical possibilities. The proposed institute will also include a school for advanced training of graduate engineers and scientists who desire to equip themselves better for research in private employment by the companies of the industry.

Funds to finance the new undertaking are being solicited by the special committee with the enthusiastic encouragement of the Board of Directors of A.G.A. Substantial pledges were assured, and it appears that the new institute may be organized early in 1940, with the desired budget promised for ten years.

Chemical Salesmen Elect New Officers

De Witt Thompson, an assistant general manager of sales for the Mathieson Alkali Works, Inc., this city, has been elected president of the Salesmen's Association of the American Chemical Industry, according to an announcement by Joseph M. Wafer, of the Industrial Chemical Sales Division of the West Virginia Pulp & Paper Co. who will retire as president of the association on December 31.

Other officers elected were: vice-president, Walter Merrill, Joseph Turner & Co., Ridgefield, N. J.; treasurer, C. O. Lind, Dow Chemical Co.; secretary, J. Furman, of Merck & Co. Elected to the executive committee were William Weed, of the Niagara Alkali Co., and R. Gould, of Heyden Chemical Co., and W. T. Short, of Wishnick-Tumpeer, Inc.

Lower Costs for Microfilm Sets of Periodicals

The Committee on Scientific Aids to Learning, President Conant of Harvard, chairman, has made a grant to cover the cost of making a microfilm master negative, on the most expensive film, of sets of volumes of scientific and learned journals. This permits the non-profit Bibliofilm Service to supply microfilm copies at the sole positive copy cost, namely 1 cent per page for odd volumes, or a special rate of ½ cent per page for any properly copyable 10 or more consecutive volumes. The number of pages will be estimated on request to Biblioform Service, care U. S. Department of Agriculture Library, Washington, D. C.

JAPAN FACES LARGE SHORTAGE OF AMMONIUM SULPHATE IN CURRENT FERTILIZER SEASON

Special Correspondence

JAPAN is facing a 400,000 ton shortage of ammonium sulphate by the end of the current fertilizer year (July 31, 1940) as a result of the principal producers' inability to secure an adequate supply of electric power, according to accounts in the industrial press. Another reason for the shortage of ammonium sulphate and other synthetic fertilizers is the failure of the government to live up to its earlier promises that it would guarantee the supply of construction materials for new fertilizer plants. Finally, the development of sidelines (explosives, cryolite, etc.) to supply urgent armament requirements has seriously cut into the production of fertilizers.

Moreover, imports of calcium cyanide and super-phosphate, formerly supplied by Germany and France under special arrangements, have practically ceased since the outbreak of the European war.

Most important fertilizer to Japan's farmers is ammonium sulphate, however. And according to an investigation by the Ammonium Sulphate Manufacturers' Association, production by all plants in Japan and Manchukuo is at present running 70,000 metric tons a month below last year's average output. As a result, total production for the next 10 months is not expected to exceed 840,000 tons. The annual production of ammonium sulphate in Korea is 420,000 metric tons, in Manchukuo approximately 100,000 metric tons. Including the carry-over from last year, supply for the fertilizer year will amount to something like 1,370,000 metric tons, against an estimated demand of 1,762,000 tons.

Late last year Japan was officially pronounced self-sufficient in ammonium sulphate as importation of the fertilizer ceased (except from Manchukuo). This has turned out to be an illusion however, stocks have been drawn upon to make up for the deficiency of month-to-month production, and these stocks are now exhausted.

The South Sea Development Co. has announced that it will increase its phosphorite to 170,000 output tons annually through intensive development of its properties in the Southeastern Pacific. Present production is about 75,000 tons a year. During the first six months of 1939 Japan imported 384,373 tons of the mineral, almost the same quantity as for the corresponding period of 1938. However, there was a marked decline of imports from Egypt and the Straits Settlements, while shipments from the United States and some other producing countries gained proportionately.

Promotion of new business in the chemical industry of Japan continued through the month of September, although at a much slower rate than during the corresponding month of last year, according to a report by the Industrial Bank of Japan. Capital invested in new companies amounted to ¥172,038,000, representing 38 per cent of the capital newly invested in all industries and trades (¥449,000,000).

The Showa Electro-Industrial Co., which has produced alumina by a process of its own design, has decided to adopt the Bayer process in further operations. The change-over was made to improve efficiency and lower production cost. Showa's alumina plant is located in Yokohama.

The Japan Oil & Fat Co. has decided to industrialize its process of manufacturing aircraft lubricants from fish oil. A site for the plant has been selected near Japan Oil's Amagasaki factory. Besides whale oil, sardine oil and herring oil will serve as starting materials in the manufacture of aircraft lubricants. The oil produced by the company's undisclosed process is claimed to be of superior quality.

With test production already under way at its Kohama plant, the Japan Hydrogen Industrial Co. will shortly market synthetic methanol on a commercial scale. The completion of an ammonium sulphate plant by this company, originally scheduled for the end of this year, has been delayed due to difficulties in procuring construction materials. However, a new sulphuric acid plant with an annual capacity of 96,000 metric tons is expected to be ready for test runs by the end of this year.

A plant for the production of synthetic tannin is under construction at Oji, near Tokyo, by the Nissan Chemical Industrial Co. (the former Japan Chemical Co.). Six tons a day will be the initial productive capacity.

Symposium on Separation At Michigan

Each year during the Christmas holidays, the Industrial and Engineering Division of the American Chemical Society holds a symposium of timely interest to some branch of chemical engineering. This year "Separation Operations" has been chosen as the subject and the University of Michigan will play host to the meeting which will be held at Ann Arbor on Dec. 28–29. On Thursday morning, Dec. 28 with D. B. Keyes presiding, introductory addresses will be made by G. C. Brown and W. L. Badger. C. C. Ralston will read a paper on "Electrostatic Separation Process" and Ernest A. Hauser will discuss "Separation and Fractionation Colloidal Dispersions."

In the afternoon, with C. C. Furnas presiding, papers will be submitted by Charles Lapple and C. B. Shepherd on "Calculation of Particle Trajectories", by Robert V. Kleinschmidt on "Factors in Spray Scrubber Design", and by Arthur Wright on "Filtration's Future".

The morning meeting on Dec. 29 will be in charge of W. L. McCabe and will include talks by Henry T. Ward and Karl Kammermeyer on "Sedimentation in the Laboratory", Edward W. Comings on "Thickening Calcium Carbonate Slurries", H. C. Caldwell and G. Seavoy on "Vacuum Crystallizer", and by Hans Svanoe on "Jeremiassen Crystallizer".

D. L. Katz will conduct the afternoon meeting session which will be given over largely to papers by John W. Hassler on "Absorption as a Means of Separation", George K. Engelhart, on "Flotation as Applied to Modern Cement Manufacture", and C. C. DeWitt on "Flotation—Concentration".

Columbia Alumni Facilitate Exchange of Research

A plan to organize approximately 2,000 former students in the Department of Chemistry of Columbia University into an alumni body to facilitate the exchange of chemical research between the Department and its graduates is announced by Prof. Harold C. Urey.

Dr. Donald E. Price of the National Oil Products Co., Harrison, N. J., permanent sceretary of the Columbia chemists' luncheon group of the American Chemical Society, is in charge of the organization. A letter outlining the plan will be sent to 900 former students who are registered in the Department.

F. P. Garvan, Jr. President of The Chemical Foundation

At a meeting of the trustees of The Chemical Foundation, Inc., held Nov. 22, Terrence J. McManus and Dr. James Alexander Miller were appointed trustees. Mr. McManus is the senior partner of the law firm of McManus, Ernst and Ernst. Dr. Miller has served as president of the National Tuberculosis Association and has been a director and officer in other medical organizations.

At the meeting of the board of directors on Nov. 25, the following officers were elected: president, Francis P. Garvan, Jr.; vice-president, George J. Corbett; treasurer, William W. Buffum; secretary, Edward J. Muhs. Mr. Garvan assumes the office of president which was held by his father from the formation of The Foundation until his death in November, 1937.

NEWS FROM WASHINGTON

Washington News Bureau
McGraw-Hill Publishing Co.
Paul Wooton, Chief

CONGRESS will return to Washington early in January facing three big controversies and numerous smaller ones. The whole question of Federal budgets, finance, and deficits must be faced. The trade agreement program will be under fire because the present authority of the President expires June 12. Numerous major items of neutrality legislation must be reconsidered especially in view of the Oriental military developments of recent weeks.

There is little that business men can do with respect to a large number of labor questions on which legislative adjustment is desired. Wage and hour amendments will be pressed. And some effort will be made to tinker up the Wagner Labor Relations Act. But the other bigger questions may loom so important before Congressmen as to make these and other items of business legislation seem unimportant, and hence postponable.

The fight over trade agreements may prove to be the basic issue in Congressional debate. Actually it embodies all of the fundamental issues on which industry and reformers differ. Business men will, therefore, watch it with great interest and process industry and chemical engineers cannot afford to stand aloof when the issue is joined.

It should not be forgotten, however, that all of these issues will be voted on by the individual Congressmen with one eye turned toward next summer's nominating conventions and the other eye on the November ballot box. Few members of Congress will feel free from those political considerations. Few, therefore, can vote on these questions on their merits.

International Chemicals

Washington is beginning to believe that the American manufacturers are able to pick up all of the load on most of the chemical requirements of the country for which the United States is normally dependent on imports. It is noted with interest that potassium chlorate, potassium sulphate, numerous dyes and specialties, and a wide variety of inorganic salts that are important for limited purposes are being made in the United States rather promptly. Washington now hears of almost no significant shortages. The difficulties which remain apparently center on things like the imported botanicals which are necessary as raw materials from which to develop drugs, pharmaceuticals, and other specialties. Officials realize that there is not much chance for American manufacturers to do without those goods. They hope that the shortages will not be too serious.

Perhaps most illuminating of recent events of this sort has been the effort of the Procurement Division to buy quinine sulphate. Some American producers would have been willing to supply those strategic pharmaceuticals, but could not obtain adequate supplies of cinchona bark. The only large bid received by the Procurement Division was of the Dutch interests who control the bark and who preferred to bid direct rather than to sell the bark to American processors. Apparently the effort to build a stock pile of this material created a peak in the quinine and cinchona market.

The government is continuing to purchase strategic materials but most of these are mineral raw materials like manganese, chrome, and tungsten ores, or semi-manufactured products like pig tin, quartz crystal, and optical glass. This purchasing policy is of substantial importance to chemical industry because it indicates a new philosophy of building military reserves owned by the government, but it does not appear to affect directly any of the normal products of American process industry or chemicals manufacture.

No Tariff Hurts

The State Department repeatedly indicates to visitors a stubborn adherence to tariff-cutting policy. Some officials go so far as to say that no American industry has been hurt by the cuts in rates of duty which have been imposed by the trade agreements thus far put into force. Spokesmen of industry to whom such statements are made press the Department for explanations as to what they call "hurt". But they get no satisfaction.

In the Venezuelan trade agreement, Secretary Hull agreed to cut the excise tax on fuel oil and heavy petroleum products from ½ cent to ¼ cent a gallon. Because a quota which would be so favored was fixed by the government, it was argued that this would not hurt either petroleum or competing fuels. But every American fuel interest is faced with a lower price structure than before. Similarly, the cut in zinc tariff in the Canadian agreement lowered the price of zinc in the United States almost correspondingly. The proposed cut in the excise duty on copper being considered for the Chilean agreement is arousing another, even more valid, scream of protest.

It now appears that at least 12 or 15 state delegations are solid against the trade agreement policy. They hardly dare be otherwise in view of the results thus far achieved. This means that there is little chance of extending beyond June 12 the authority of the President to negotiate such agreements. If the authority is extended, it will probably be qualified by the requirement that the Senate must ratify agreements before they take effect, as it must ratify treaties. That is about equivalent to repealing the authority since the Senate is not likely to approve most of the negotiations. Some even go so far as to urge that the State Department immediately give notice of abrogation of existing agreements. Though the feeling in Congress is very bitter against the State Department, it is not expected by impartial observers that Congress will go quite that far. The whole matter promises to become both a partisan issue and a regional or bloc controversy. Log-rolling is inevitable. The results are unpredictable even by the best informed political observers.

News "Fines"

Potash Award—Secretary of Interior Ickes has approved three leases for about 6000 acres of potash-bearing public land. This area becomes a part of the territory to be worked by American Potash and Chemical Corp. at Trona. Increased potash production there is forecast by the government.

More Weed Killer—Following announcement that additional production of sodium chlorate would be undertaken in the United States, Washington officials are pressing their ideas regarding more aggressive campaigns for weed killing. This problem is a constantly growing one and it appears that many hundreds of thousands of acres of land are becoming seriously infested and that some millions of pounds of additional weed killer must be used annually for some time in order to reclaim these areas for agriculture.

Census of Manufacturers—A new classification of chemical process industry is announced for the Census of Manufacturers. Executives and engineers of firms interested are urged carefully to study the new Census blanks which will reach them early in January. Effective cooperation with the Census Bureau in its decennial survey will require careful study of the modifications as to industry grouping and commodity classification. There are 13 sections of the chemical and allied products group. Every reader of *Chem. & Met.* is likely to find himself concerned with one or several of these.

Research Survey—The National Re-

search Council is acting as an agent for the National Resources Committee in making a survey of industrial research and its functions. This investigation is going to be carried out from a Washington headquarters opened recently. All divisions of industry are being urged to cooperate with these investigators in order that the economic and social meaning, as well as the technics and organization of research may be clarified. It is expected that the results of this inquiry may be of substantial influence in guiding of the government's work and showing up what the government cannot do as effectively as business.

Price Watchers—A new job has been assigned to TNEC. That agency has been instructed by the President to become the watchdog of price movements. It undoubtedly will bark at any price rises, and hope that some Department or the Chief Executive can do some biting for it "if the price rises are not defensible".

Defense Taxes—The President does not wish to have tax increases imposed in an election year. But the Democrats have got to do one of three things, of which the President seems to prefer the third: (a) Cut down the 1940-41 deficit to a very small figure; (b) Raise the debt limit above $45 billion, an extremely dangerous bit of proposed legislation with Congress in its present temper; or (c) Figure some new kind of tax, which the President would like to call "a defense tax". These fundamental budgetary questions will have airing and controversy in Congress. They will doubtlessly cause many business shivers, if not actual jitters, during the late Winter and Spring.

Monthly Mineral Data—The first three reports of the Bureau of Mines from its monthly surveys of strategic materials and iron and steel scrap related to production of quicksilver in September, consumption of quicksilver from January to September, and production and stocks of domestic manganese ore in September. More of these reports will come along at frequent intervals during December and the succeeding months.

Wagner Health Bill—There is considerable evidence that all industry will have to watch Senator Wagner's proposal for a new national health law. This is going to be pressed aggressively in the next Congress. It may have sufficient vote appeal to get serious attention, at least in the Senate.

Oriental Embargo—Certain Western legislators are being assisted by the State Department in drafting a bill which would have for its purpose the embargoing of many exports from the United States to the Orient. "We believe in a double standard for neutrality" is the Washington interpretation of this. Command of the Atlantic entitles our friends to get their goods. Command of the Pacific gives no comparable right to Japan. The chemical industry will inevitably be drawn into this argument because many of the goods in question other than cotton, petroleum, copper, and other metals are of chemical process industry origin. Some onlookers think that this legislation, if enacted, would merely make necessary the establishment in Japan of process industry to take the business now supplied in part from America. That boomerang factor is being ignored in the proposed legislation.

Plant Expansion Program for Ethyl Gasoline Corp.

A $4,000,000 plant expansion program is announced by the Ethyl Gasoline Corp. Manufacturing facilities at Baton Rouge, La., will be enlarged to meet the increasing needs of petroleum refiners for higher anti-knock gasoline, according to E. W. Webb, president of the corporation. Construction work will begin immediately.

A plant for manufacturing tetraethyl lead, processing plants for raw materials including an additional ethyl chloride plant, added capacity for the electrolysis of salt brines to manufacture metallic sodium and chlorine gas and other improvements are planned. This project will require the employment of between 800 and 1,000 men for construction, covering a period of about one year, and will be contracted for and done under the supervision of E. I. duPont de Nemours & Co., which company has contracted with Ethyl to operate a substantial portion of the plants at Baton Rouge owing to the former's long experience and technique developed in similar manufacturing operations at Deepwater, N. J., and Niagara Falls, N. Y.

Germany Develops New Process For Bromine Production

A new process has been patented recently in Germany for producing bromine from potash salts and potassium chloride which is stated to offer considerable advantages over processes hitherto employed, according to a report from the American Consulate General, Frankfort-on-Main.

The raw material generally used for bromine production in Germany is the cold mother liquors which are gradually enriched by bromine as they accumulate in the plants producing potash salts and potassium chloride. According to processes hitherto used, these mother liquors are heated to around 110°C. and the bromine is driven off in bromine towers. By this method, considerable amounts of bromine are separated and therefore lost through evaporation or cooling-down of the chloride salts obtained from the salt solutions.

It is alleged that the new patented process recovers the bromine from the hot solutions prior to their cooling-down and before crystallization of the salts precipitated by cooling.

Commerce Department Will Report on Inventories

The Commerce Department early in December started combing a score of basic industries for information on sales and inventories as part of the Administration's efforts to avert runaway price movements. At the same time, the Temporary National Economic Committee focused attention on the possible disturbing effects on domestic business of the buying policies of foreign governments with respect to exports and imports, having found nothing much to cavil about in the domestic price situation.

The first questionnaire sent out to several hundred concerns—small, medium and large—selected as a representative sample of all manufacturing industry calls for net sales for November, new orders received (less cancellations) during the month, unfilled orders at the end of the month and the inventory value at the end of the month of raw materials, goods in process, and supplies (fuel, shop, etc.). Comparative data are requested for June and October 1939 and November, 1938. In reporting their inventories the firms are asked to state whether it is cost value, market value, or cost or market, whichever is lower.

The size of the sample has been held to a minimum in order that returns may be speedily interpreted and the results made known without delay. Returns are due Dec. 20. The Commerce Department officials hope for sufficient cooperation to put such reporting on a regular monthly basis in future and hope particularly that they will produce information on sales and inventories for the durable goods industries for which it is now difficult to obtain data on a quantity basis because of the varied and extensive character of products.

Fluctuations in this industrial group contribute most of the cyclical nature of business in general, the Department remarked. In a letter to the firms included in the survey, Under Secretary Edward J. Noble wrote:

"The Department's Business Advisory Council and other leading industrialists and merchants seem to be in almost complete agreement that the making of sound business judgments, as well as sound governmental policies, will be greatly aided if we could all know more about the current state of such things as sales, unfilled orders, and inventories, throughout industry as a whole."

Answers to questionnaires will be strictly confidential and the data will be used by the Commerce Department only in consolidated form to indicate trends. The figures for reporting companies will be merged into totals for industry as a whole and subtotals for important divisions of industry where the sample is large enough to make these reliable.

GERMAN FOREIGN TRADE HELD UP WELL IN FIRST THREE MONTHS OF WAR

Special Correspondence

THAT the British blockade on German imports and exports has apparently not been as effective as anticipated is indicated in the Reich's foreign trade in three months of war. The Reich is still in contact with countries from which it obtained 40 per cent of its imports in 1938 and to which it sent 51 per cent of its exports. These countries accounted for 79 per cent of Germany's European imports and 78 per cent of its European exports. France and England supplied only 8.2 per cent of the Reich's imports and took only 11 per cent of its total exports in 1938. The loss of French and English trade, according to present indications, will be offset by the increase in Soviet Russian trade.

Overseas trade has practically ceased. However, it is of interest that Manchukuo is negotiating with Soviet Russia to transport soybeans to the Reich via the Transsiberian railway. In spite of the higher transport costs, Germany, which imported 70 million RM soybeans last year, would be willing to pay the increased price for this important commodity. The connection with the Pacific Ocean might also prove significant. The blockade has not stopped German trade relations with Denmark, Sweden and the Baltic countries. Imports from Spain and Portugal continue through Italy, and trade with Turkey is carried on over the Danube, while trade of Italy, Switzerland and the countries of east and southeast Europe can hardly be intercepted because of their geographical position in relation to the Reich. According to a recent statement of the German Economic Minister Funk at the Vienna trade fair, the Reich should be able to maintain up to 80 per cent of its peace time foreign trade.

In the first three war months, coal has proved the leading German export item, and the coal industry is working 120 per cent of its previous capacity to meet export requirements. The Nordic countries, including Finland, Sweden, Norway and Denmark, have been taking increased supplies from Germany since England is not in a position to make regular deliveries there.

Also important in the Reich's export trade are potash and cement. Recent contracts have been concluded with Denmark and Sweden for these items. Latvia has opened its former import quotas for England and France to German exporters, and Lithuania, unable to carry on its important bacon trade with England has already turned to Germany and Russia to export this item. Some of the shrinkage in English trade with the Netherlands has also been taken up by Germany. On the other hand, the decline in general foreign trade of the neutrals has already caused several of them to introduce currency and import restrictions themselves. The recently renewed Rumanian-German trade pact as well as those concluded with Bulgaria and Jugoslavia, however, indicate a further expansion of trade in the Southeast, assuming that the conflict does not spread to those regions.

The Reich will probably continue to be the chief supplier of chemicals to the aforementioned countries. Sweden, for instance, has always been a large importer of chemicals, for which it paid by exports of matches and explosives—statistics no longer being published on the latter item. Valuable iron ore exports are also helping to pay for imports. The Swedish chemical industry, with a reported production valued at 65 million dollars in 1937, is considered inadequate to supply the needs of the country. Sweden has depended on imports for many important items, including raw materials as sodium- and calcium nitrates, potash, phosphates, sodium sulphate, and sulphur. The high wage scale for Swedish labor at home and cheaper prices on chemicals obtainable in nearby countries, as well as freedom to trade without import or currency restrictions have in the past discouraged attempts to strive for greater chemical self-sufficiency in Sweden.

Norway is also an important exporter of explosives, ammunition, and matches. Its total imports of chemicals and allied products in 1937 amounted to $13,566,000, and exports to $23,260,000. Aside from the pulp and paper industry, the chemical, electrochemical and metallurgical industries are the most important. The latter industries, soundly organized, are based on cheap water power available in that country. The largest enterprise in the electro-chemical field Elektrisk Kvaelstofaktieselskab (Norsk Hydro), producing chiefly calcium nitrate and some sodium and ammonium nitrates, has been closely allied with the German I. G. Farbenindustrie since 1927.

Finland has a comparatively young chemical industry and its output was valued at about 11 million dollars in 1938. Since 73 per cent of Finland, which is about the size of California, is forestland, agriculture and the timber, pulp and paper industries are of paramount importance. The woodworking industries supply the larger part of exports and help to pay for Finland's imports. Finnish exports of chemicals are very modest, valued at about 1½ million dollars in 1938, with imports of chemicals and allied products of 17 million dollars.

Because the German chemical industry has been the focal point of the Reich's Four Year plan and has operated under virtually emergency conditions for several years, the shift to war time production has not occasioned great difficulties. Some changes have occurred in the directorates in German corporations, for instance, in the Carl Lindström A. G., Berlin, an affiliate of the Columbia Grammophone Company, Ltd., London, where the English directors have resigned. The German directors of the Algemeene Kunstzijde N. V. (Aku), Arnhem in Holland, have withdrawn from the administration of the Dutch rayon concern, and the Dutch members have withdrawn from the German Vereinigte Glanzstoff-Fabriken A. G., Wuppertal-Elberfeld, as well as the I. P. Bemberg A. G. Similarly, English and German directors have withdrawn from the respective branches of the British Unilver concern in Germany and England, and have appointed Dutch representatives to look after their interests in the two countries which are at war.

Although plans are proceeding for international chemical congresses to be held in Germany in the summer of 1940, the national chemical congress and Dechema meeting to have been held in Salzburg the latter part of September of this year, have been postponed.

CALENDAR

JAN. 12-13, 1940, LOUISIANA ENGINEERING SOCIETY, annual meeting, St. Charles Hotel, New Orleans, La.

FEB. 19-22, 1940, TECHNICAL ASSOCIATION OF THE PULP & PAPER INDUSTRY, annual meeting, Hotel Roosevelt, New York, N. Y.

APRIL, 8-12, 1940, AMERICAN CHEMICAL SOCIETY, annual meeting, Cincinnati, Ohio.

APRIL 24-27, 1940, ELECTROCHEMICAL SOCIETY, annual meeting, Galen Hall, Wernersville. Pa.

MAY 13-15, 1940, AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, Buffalo.

MAY 27-31, 1940, AMERICAN PETROLEUM INSTITUTE, mid-year meeting, Fort Worth. Tex.

PERSONALITIES

C. Lalor Burdick

✦ C. LALOR BURDICK has been appointed assistant to the president of the E. I. du Pont de Nemours & Co. He succeeds Henry B. du Pont, recently advanced to the position of vice-president and member of the executive committee. Since 1928 Dr. Burdick has been employed by the du Pont company, with which he has served as assistant chemical director in the Ammonia Department and as technical investigator in the Development Department.

✦ A. D. QUACKENBUSH, JR., of Mobile, Ala., and a graduate of the chemical engineering departments of the University of Alabama and of the Iowa State College, is now with the Monsanto Chemical Co. at St. Louis.

✦ N. B. PILLING has been made director of the Bayonne (N. J.) laboratory of the International Nickel Co. W. A. Wesley is assistant director, E. M. Wise, staff adviser and D. C. West, manager.

✦ HAROLD J. STEIN, research engineer of the Allis-Chalmers Mfg. Co., has been appointed director of both chemical and metallurgical research, bringing all these activities under a single head. His assistant will be J. T. Jarman.

✦ F. A. KELLER has accepted the position of chief chemist of the Bright Star Battery Co. at Clifton, N. J.

✦ EDWARD MACK, JR., former head of the Department of Chemistry at the University of North Carolina, has been appointed to the supervisory staff of Battelle Memorial Institute.

✦ ROBERT L. QUAIT has been made director of research and sales of the Limestone Products Corp., Newton, N. J.

✦ WILLIAM F. TALBOT who joined the staff of Arthur D. Little, Inc., in June for the purpose of carrying out studies for the General Printing Ink Corp., has recently been made research director for the latter company. He will be located in New York.

✦ WILLIAM J. SPARKS has been appointed chief of the Oil and Protein Division, Northern Regional Research Laboratory of the Bureau of Agricultural Chemistry and Engineering.

✦ WILLIAM CALLAN has been elected vice-president in charge of casein, adhesives and prescription products division of the Borden Co. by the Board of Directors. Mr. Callan is director of research for the Borden Co. and president of two of its divisions, the Casein Company of America and the National Milk Sugar Co.

✦ PAUL W. MCDANIEL has been named chemical engineer for the Pennsylvania State Department of Health. His home is in Everett, Pa.

✦ WALTER H. ALDRIDGE, president of the Texas Gulf Sulphur Co., has been selected to receive one of the first medals for distinguished engineering achievement by the Columbia University School of Engineering. The awards in memory of Professor Thomas Egleston will be made to outstanding graduates of the school. Among the others receiving the awards are: Marston T. Bogert, professor of organic chemistry at Columbia; Robert C. Stanley, president of the International Nickel Co. and Irving Langmuir of the General Electric Co.

✦ FREDERICK S. BACON has established a consulting organization at Watertown, Mass. He expects to specialize in plastics, adhesives, organic research and sales development.

✦ DAVID T. JAMES, of the R. & H. Chemicals Department, E. I. du Pont de Nemours & Co., Niagara Falls, N. Y., received the 1939 Undergraduate Student Award of the A.S.M.E.

✦ L. W. BABCOCK has become manager of the Kenvil (N. J.) plant of the Hercules Powder Co.

✦ RAYMOND STEVENS, vice-president of Arthur D. Little, Inc., Cambridge, Mass., whose appointment as director of the National Research Council's survey of research in industry as a natural resource, has been announced.

✦ A. B. HOEFER has been appointed eastern district manager with offices in New York by Udylite Corp. He is a graduate of the chemical engineering department of Purdue University.

✦ CLAIRE C. BALKE and GREGORY J. COMSTOCK have been appointed to the faculty of the recently organized division of powder metallurgy at the Stevens Institute of Technology.

✦ GEORGE L. CROSBY, vice-president of Roller-Smith Co., died suddenly at his home in Bethlehem, Pa., on December 2.

✦ HUGO KOBLENZER died on December 2 at the Polyclinic Hospital, New York, after an illness of two weeks. He was 59 years old. Mr. Koblenzer had been connected with Standard Chemical Products, Hoboken, N. J.

✦ CHARLES S. PALMER died on November 30 at Pittsburgh at the age of 81 years. He had been president of the Colorado School of Mines, associate editor of *Engineering & Mining Journal*, inventor of cracking processes for gasoline and had been engaged in many other activities.

✦ SAMUEL FOX, founder and manager of the Chemical Supply Co., Los Angeles, Calif., died October 12.

✦ H. P. BASSETT was killed by an automobile in Philadelphia on November 24. Dr. Bassett was returning home after spending the evening in his research laboratory when he was struck by the car. He was born in Kentucky and was graduated from Kentucky State College and Johns Hopkins University. He came to Philadelphia in 1918 and was associated with several firms before he became president of Meigs, Bassett & Slaughter, Inc.

✦ OTTO L. ROHLFING, formerly assistant superintendent of the Mallinckrodt Chemical Works, died November 24 at his home in St. Louis. He was 64 years old.

✦ RALPH S. MACPHERRAN, chief chemist of the Allis-Chalmers Mfg. Co. for many years and who only recently retired from active service because of a heart ailment, died November 13 at Duluth where he was visiting. In 1913 he was awarded the coveted J. H. Whiting gold medal of the American Foundrymen's Association.

✦ LOUIS WIENEKE died at Bergen, Norway, on September 13 following an appendicitis operation. He had graduated from Kansas State College in 1930 and had been stationed in Budapest, Hungary, for several years where he was employed by the Socony Vacuum Oil Co.

✦ EARLE K. STRACHAN, associate professor of industrial chemistry at Brown University, Providence, R. I., died November 19 of a heart attack. He had been active at the Providence meeting of the A.I.Ch.E.

Chemical ECONOMICS and MARKETS

CHEMICAL CONSUMPTION IN FINAL QUARTER 25 PER CENT ABOVE 1938 LEVEL

BASED on reports of current activities in the principal consuming industries consumption of chemicals in the final quarter of this year will be approximately 25 per cent higher than it was in the last three months of last year. Seasonal influences and a smaller number of working days cut consumption in November from the high total reported for October but in different cases the rate of manufacturing operations was maintained and but little change is anticipated for the present month. *Chem. & Met's* index for consumption of chemicals in November is preliminarily placed at 142 which compares with a revised index of 147.43 for October and with 114.82 for November 1938.

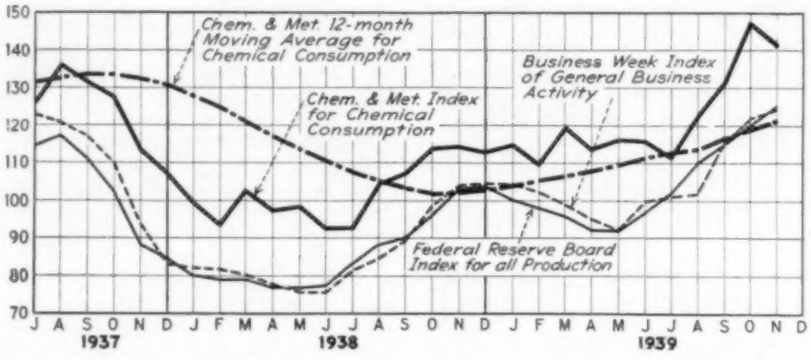
***Chem. & Met.* Index for Consumption of Chemicals**

	September Revised	October
Fertilizer	24.48	31.55
Pulp and paper	17.10	19.50
Glass	13.44	14.93
Petroleum refining	13.77	14.40
Paint and varnish	12.45	11.63
Iron and steel	9.21	11.70
Rayon	8.90	9.94
Textiles	8.07	8.96
Coal products	7.88	8.63
Leather, glue and gelatine	4.45	4.40
Explosives	5.24	5.93
Rubber	3.04	3.42
Plastics	2.30	2.44
	130.33	147.43

Production of superphosphate rose sharply in October with manufacturers representing approximately 95 per cent of the industry reporting an output of 406,809 tons of bulk goods as compared with 305,538 tons for the preceding month. Production of wet base and wet mixed goods, however, fell off from the September figure but the ten months total for all production was raised sufficiently to exceed the total for the comparable period of last year.

As more complete data were received for manufacturing operations in October, it became evident that the rate of operations had been speeded up considerably over that maintained in the preceding month. The revised index for consumption of chemicals stands at 147.43 which is the highest point reached since March 1937. Pulp and paper outputs included some new highs for the industry with many plants working on a 24-hour seven-day week basis. Glass plants also made a fine showing with container output having been exceeded only in three previous months—June, July, and August 1937. Window glass production amounted to 1,121,288 boxes—the largest for any month—in two years. Plate glass was turned out in larger volume than in any month since June 1937. Delivery of explosives, with the exception of March 1937, was at the highest rate for the last nine years. Consumption of rubber, including crude and reclaimed, created a new monthly record for the industry and the same was true for the volume of petroleum refined.

Exports of sodium compounds in October amounted to 100,000,000 lb. which is a gain over the September total of 93,955,463 lb. The September total included 24,227,604 lb. of soda ash and 36,539,228 lb. of caustic soda and the nine months figures were in excess of 91,000,000 lb. for ash and approximately 167,000,000 lb. for caustic so that both these chemicals will show a material gain in export trade this year.

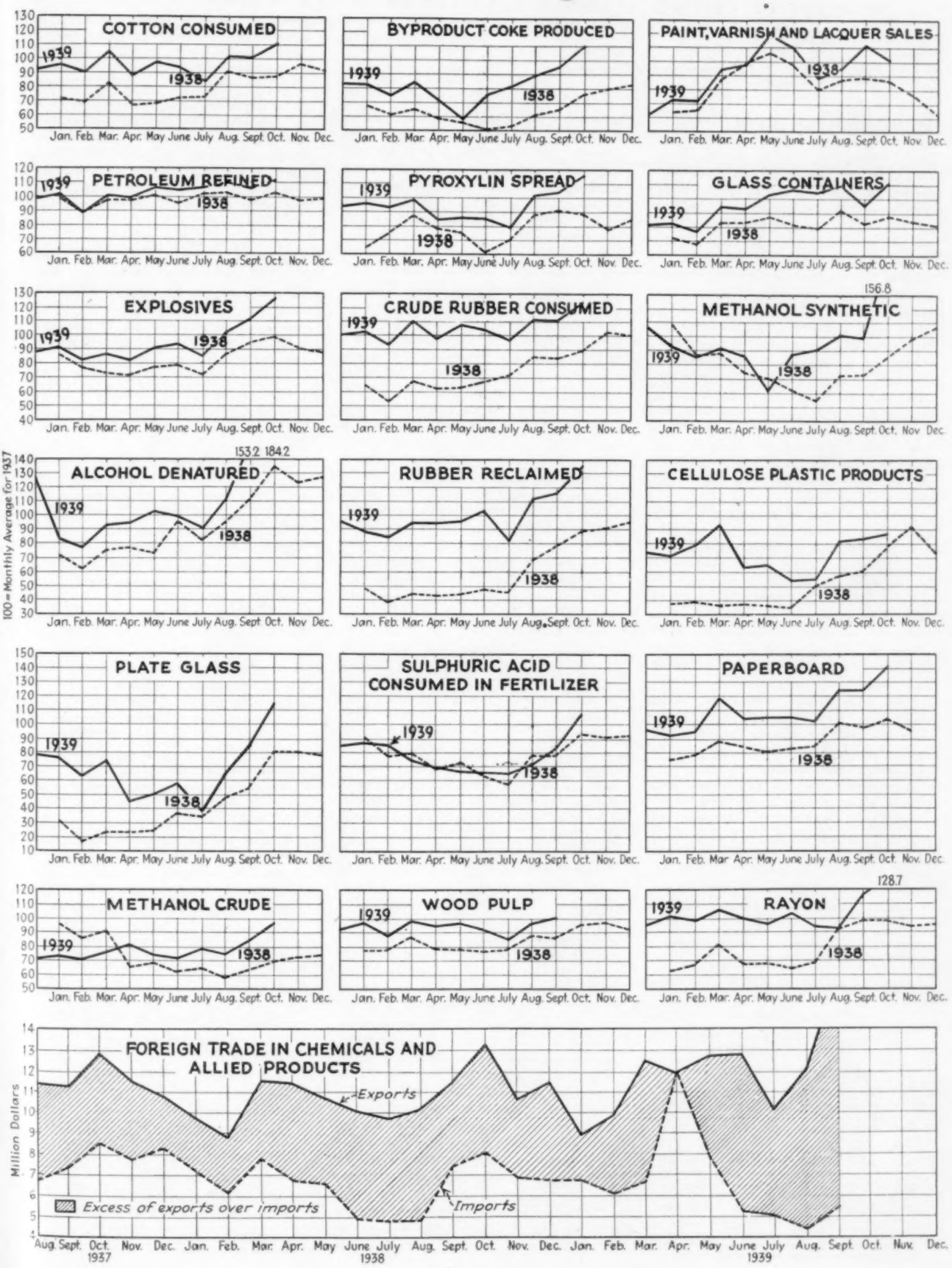

Chem. & Met. 12-month Moving Average for Chemical Consumption
Business Week Index of General Business Activity
Chem. & Met. Index for Chemical Consumption
Federal Reserve Board Index for all Production
150
140
130
120
110
100
90
80
70
J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1937
1938
1939

Production and Consumption Data for Chemical-Consuming Industries

	October 1939	October 1938	January-October 1939	January-October 1938	Per cent of gain for 1939
Production					
Alcohol, ethyl, 1,000 pr. gal	20,965	17,017	177,743	160,815	10.6
Alcohol, denatured, 1,000 wi. gal	15,181	11,099	89,206	72,253	23.4
Ammonia, liquor, 1,000 lb	4,777	3,879	38,448	32,628	17.9
Ammonium sulphate, tons	57,847	42,045	456,930	345,881	32.1
Benzol, 1,000 gal	10,891	7,100	79,704	55,941	42.5
Byproduct coke, 1,000 tons	4,527	3,093	33,746	25,156	34.1
Glass containers, 1,000 gr	4,891	3,866	42,880	35,880	19.5
Plate glass, 1,000 sq ft	18,369	12,869	107,528	60,151	78.8
Methanol, crude, 1,000 gal	463	335	3,746	3,469	7.9
Methanol, synthetic, 1,000 gal	4,158	2,295	25,460	20,560	23.8
Paperboard, tons	506,466	370,977	3,970,722	3,142,876	26.3
Cellulose acetate plastics					
Sheets, rods, and tubes, 1,000 lb	713	945	7,429	4,388	69.3
Molding material, 1,000 lb	1,333	989	9,196	5,551	65.7
Nitrocellulose plastics, 1,000 lb	1,315	1,051	10,923	7,681	42.2
Pyroxylin spread, 1,000 lb	6,371	4,922	52,378	42,930	22.0
Rubber reclaimed, tons	20,896	14,652	155,239	89,203	74.3
Sulphuric acid in fertilizer trade, tons	205,024	161,285	1,623,238	1,428,890	13.6
Consumption					
Cotton, bales	686,936	543,857	5,995,715	4,742,218	26.4
Silk, bales	41,858	35,631	330,070	334,991	1.5*
Wool, 1,000 lb	45,258	33,279	330,690	214,090	54.5
Explosives, shipments, 1,000 lb	40,612	32,151	265,801	230,518	15.3
Paint, varnish and lacquer, sales, $1,000	35,828	30,007	337,226	300,147	12.4
Rubber, crude, tons	55,764	42,850	474,841	332,865	42.7

* Per cent of decline.

Production and Consumption Trends



SCARCITY OF OFFERINGS BRINGS ADVANCES IN PRICE FOR MANY CHEMICALS

WITHDRAWALS against contracts have accounted for a large movement of chemicals from producing plants and have kept stocks in producers possession at a low level. In many cases distribution against existing orders has left no surplus for spot trading and has created a nominal price position. Different reports have been in circulation regarding the accumulation of large inventories. If such reports have application to the chemical industry, it is difficult to see at what point the accumulations have occurred. In the majority of cases producers are moving out stocks as fast as produced so that reserve stocks at chemical plants are improbable. Judging from reports from the leading consuming industries, chemicals are being converted into finished products practically as fast as received so if there are large holdings of chemicals anywhere, they are not in their original form.

The high rate at which pulp and paper mills have been operating has accentuated the difficulty in obtaining sufficient supplies of salt cake. Many pulp mills had been receiving salt cake from Germany and with the cessation of these imports, new sources of supply had to be found. Domestic production has been increased and is taking up part of the slack but prices have been advanced and additional transportation charges further adds to delivered costs. Many mills have turned to substitute materials and are reported to be obtaining satisfactory results from the use of soda compounds and sulphur.

As demand for chemicals has continued along rising lines, values have strengthened under the influence of lessened competition and higher costs of production. The solvent group has been especially outstanding in recent trading by its change about from an era of price cutting to actual advances in sales schedules. Carbon black is another material which has suffered from sales pressure but the trend now is upward with some manufacturers already having marked up the price for 1940 contracts. Phosphate of soda not only has been selling freely in domestic markets but also has found a good export inquiry and the market is freer of competition than it has been in a long time.

Prices for casein have eased off from the high level reached in September. With the probability that imports would be restricted or at least would be affected by higher transportation costs, values in domestic markets advanced sharply following the outbreak of the war. Stocks in sellers hands were not large and quotations were moved up to a point above the parity of import values. Domestic production of casein in 1938 fell to 48,549,000 lb. from 67,467,000 lb. for the preceding year. The low prices which prevailed over the greater part of 1937 acted as a deterrent to production since then and thereby created a more active demand for imported material. Imports for the first nine months of this year amounted to 3,406,813 lb. compared with 286,195 lb. for the corresponding period of 1938.

Continuous distillation of fatty acids in bubble tower stills is not properly restricted by patents of Goranflo and Tolman, according to a decision of the Delaware U. S. District Court. That court stated: "The employment of continuous column bubble stills in fields where they had not been previously used is not invention. The use of a bubble tower in lieu of a less efficient type of still has been held not to amount to invention."

Unless this decision is overturned, it means that the several firms using varied forms of columns may go ahead without difficulty. The defendant in this case, W. C. Hardesty Company, is not the only one interested, as apparently there are at least four independent developments of this sort being used commercially.

The litigation here involved is of increasing importance to varied chemical process industry because of the growing use of the fatty acids either for themselves or as substitutes for fats. Those who wish to supply these materials will under this decision no longer be compelled to limit themselves to the Wecker process (German), but can go ahead with the many special adaptations of petroleum and other chemical engineering devices.

A number of other patents held by New Process Fat Refining Corp., the owner of Tolman and Goranflo patents, were not involved in this suit, and therefore were not ruled invalid.

Chemical and related product exports increased 50 per cent to a total valuation of approximately $25,000,000 in October compared with the corresponding month of last year, according to the Department of Commerce. The increase was general throughout the list, with a number of classes including industrial chemicals, chemical specialties, medicinals, pharmaceuticals, coal-tar products, naval stores, and paint products, recording gains up to 100 per cent.

Outstanding gains were recorded in exports of industrial chemicals, shipments of which increased in value from $2,511,000 in October 1938 to $5,160,000 during the current October. In this group exports of sodium compounds increased in quantity from 50 to 100 million pounds and industrial gases, from 900,000 to 2,373,000 pounds.

Foreign demand for medicinals continued the upward trend noted in September. Exports of such products during October were recorded at $2,800,000 which was an increase of more than 60 per cent over the value of such products shipped abroad in the corresponding month of last year when the total reached $1,700,000. In this group exports of biologics increased in value from $306,400 to $410,000; non-proprietaries, from $482,000 to $1,025,000; and proprietaries, from $858,000 to $1,025,000.

Foreign demand for American coal-tar products, particularly dyes was also considerable in October when exports of such products reached a total value of $1,798,000 against $891,000 in the corresponding month of last year. Coal-tar dyes, colors, etc. shipments of which increased in quantity from 602,600 lb. to 1,371,000 lb. during these periods accounted for the bulk of the gain.

Sharp gains were also recorded in exports of naval stores in October. Shipments during the month aggregated $2,270,000 in value, compared with 1,138,000 in October 1938. In this group exports of turpentine increased in quantity from 1,179,000 to 1,677,000 gal. and rosin from 77,500 to 140,000 bbl.

CHEM. & MET.

Weighted Index of

CHEMICAL PRICES

Base = 100 for 1937

This month	**98.86**
Last month	97.73
December, 1938	98.92
December, 1937	99.81

The sold-up position of some chemicals has created nominal prices in the spot market. There is a strong general undertone. Price changes included advances in the solvent group affecting denatured alcohol, butyl alcohol, acetone, and turpentine.

CHEM. & MET.

Weighted Index of Prices for

OILS AND FATS

Base = 100 for 1937

This month	**78.25**
Last month	80.75
December, 1938	72.21
December, 1937	80.64

The price trend has continued downward with domestic oils pointing the way and foreign oils holding a strong position due to restricted offerings and increased transportation costs. Tallow also was lower in price.

Current PRICES

INDUSTRIAL CHEMICALS

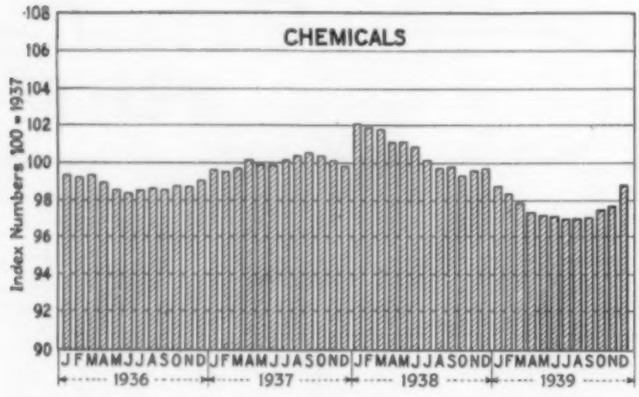
	Current Price	Last Month	Last Year
Acetone, drums, lb.	$0.07 -$0.07¼	$0.06 -$0.06½	$0.05½-$0.06½
Acid, acetic, 28%, bbl., cwt.	2.23 - 2.48	2.23 - 2.48	2.23 - 2.48
Glacial 99%, drums	8.43 - 8.68	8.43 - 8.68	8.43 - 8.68
U. S. P. reagent	10.25 -10.50	10.25 -10.50	10.25 -10.50
Boric, bbl., ton	106.00-111.00	106.00-111.00	106.00-111.00
Citric, kegs, lb	.20 - .23	.20 - .23	.23½- .26
Formic, bbl., ton	.10½- .11	.10½- .11	.10½- .11
Gallic, tech., bbl., lb	.70 - .75	.70 - .75	.70 - .75
Hydrofluoric 30% carb., lb	.07 - .07½	.07 - .07½	.07 - .07½
Lactic, 44%, tech., light, bbl., lb.	.06½- .06¾	.06½- .06¾	.06½- .06¾
Muriatic, 18°, tanks, cwt.	1.05 -.....	1.05 -.....	1.05 -.....
Nitric, 36°, carboys, lb.	.05 - .05½	.05 - .05½	.05 - .05½
Oleum, tanks, wks., ton	18.50 -20.00	18.50 -.....	18.50 -20.00
Oxalic, crystals, bbl., lb.	.10½- .12	.10½- .12	.10½- .12
Phosphoric, tech., c'boys., lb.	.07½- .08½	.07½- .08½	.09 - .10
Sulphuric, 60° tanks, ton	13.00 -.....	13.00 -.....	13.00 -.....
Sulphuric, 66°, tanks, ton	16.50 -.....	16.50 -.....	16.50 -.....
Tannic, tech., bbl., lb.	.40 - .45	.40 - .45	.40 - .45
Tartaric, powd., bbl., lb.	.31½-.....	.31½-.....	.27½-.....
Tungstic, bbl., lb.	nom.....	2.35 -.....	2.75 -.....
Alcohol, Amyl	....-.....	....-.....	....-.....
From Pentane, tanks, lb.	.101-.....	.101-.....	.106-.....
Alcohol, Butyl, tanks, lb.	.09 -.....	.08 -.....	.08½-.....
Alcohol, Ethyl, 190 p'f., bbl., gal.	4.54 -.....	4.54 -.....	4.58½-.....
Denatured, 190 proof			
No. 1 special, bbl., gal. wks.	.29½-.....	.28½-.....	.30 -.....
Alum, ammonia, lump, bbl., lb.	.03½- .04	.03½- .04	.03½- .04
Potash, lump, bbl., lb.	.03½- .04	.03½- .04	.03½- .04
Aluminum sulphate, com. bags, cwt.	1.15 - 1.40	1.15 - 1.40	1.15 - 1.40
Iron free, bg., cwt.	1.30 - 1.55	1.30 - 1.55	1.30 - 1.55
Aqua ammonia, 26°, drums, lb.	.02½- .03	.02 - .03	.02½- .03
tanks, lb.	.02 - .02½	.02 - .02½	.02½- .02½
Ammonia, anhydrous, cyl., lb.	.16 -.....	.16 -.....	.15½-.16
tanks, lb.	.04½-.....	.04½-.....	.04½-.16
Ammonium carbonate, powd. tech., casks, lb.	.09 - .12	.09 - .12	.08 - .12
Sulphate, wks, cwt.	1.40 -.....	1.40 -.....	1.3875-.....
Amylacetate tech., tanks, lb.	.10½-.....	.10½-.....	.09 -.....
Antimony Oxide, bbl., lb.	nom	.17 - .18	.11½- .12
Arsenic, white, powd., bbl., lb.	.03 - .03½	.03 - .03½	.03 - .03½
Red, powd., kegs, lb.	.15½- .16	.15½- .16	.15½- .16
Barium carbonate, bbl., ton.	52.50 -57.50	52.50 -57.50	52.50 -57.50
Chloride, bbl., ton	79.00 -81.00	79.00 -81.00	79.00 -81.00
Nitrate, casks, lb.	.07 - .08	.07 - .08	.07 - .08
Blanc fixe, dry, bbl., lb.	.03½- .04	.03½- .04	.03½- .04
Bleaching powder, f. o. b., wks., drums, cwt	2.00 - 2.10	2.00 - 2.10	2.00 - 2.10
Borax, gran., bags, ton	48.00 -51.00	48.00 -51.00	48.00 -51.00
Bromine, cs., lb	.30 - .32	.30 - .32	.30 - .32
Calcium acetate, bags	1.90 -.....	1.75 -.....	1.65 - 1.75
Arsenate, dr., lb.	.06½- .07	.06½- .07	.06½- .07
Carbide drums, lb.	.05 - .06	.05 - .06	.05 - .06
Chloride, fused, dr., del., ton.	21.50 -24.50	21.50 -24.50	21.50 -24.50
flake, dr., del., ton.	23.00 -25.00	23.00 -25.00	23.00 -25.00
Phosphate, bbl., lb.	.07½- .08	.07½- .08	.07½- .08
Carbon bisulphide, drums, lb.	.05 - .06	.05 - .06	.05 - .06
Tetrachloride drums, lb.	.04½- .05½	.04½- .05½	.05½- .06
Chlorine, liquid, tanks, wks., lb.	1.75 -.....	1.75 -.....	2.15 -.....
Cylinders	.05½- .06	.05½- .06	.05½- .06
Cobalt oxide, cans, lb.	1.84 - 1.87	1.84 - 1.87	1.67 - 1.70
Copperas, bgs., f. o. b., wks., ton.	17.00 -18.00	15.00 -16.00	15.00 -16.00
Copper carbonate, bbl., lb.	.10 - .16½	.10 - .16½	.09 - .16
Sulphate, bbl., cwt.	4.75 - 5.00	4.75 - 5.00	4.50 - 4.75
Cream of tartar, bbl., lb.	.25½-.....	.25½-.....	.22½-.....
Diethylene glycol, dr., lb.	.22 - .23	.22 - .23	.22 - .23
Epsom salt, dom., tech., bbl., cwt.	1.80 - 2.00	1.80 - 2.00	1.80 - 2.00
Ethyl acetate, drums, lb.	.061-.....	.061-.....	.06½-.....
Formaldehyde, 40%, bbl., lb.	.05½- .06½	.05½- .06½	.05½- .6½
Furfural, tar ks. lb.	.09 -.....	.09 -.....	.09 -.....
Fusel oil, ref. drums, lb.	.16 - .17	.16 - .17	.12½- .14
Glaubers salt, bags, cwt.	.95 - 1.00	.95 - 1.00	.95 - 1.00
Glycerine, c.p., drums, extra, lb.	.12½-.....	.12½-.....	.14½-.....
Lead:			
White, basic carbonate, dry casks, lb.	.07 -.....	.07 -.....	.07 -.....
White, basic sulphate, sck., lb.	.06½-.....	.06½-.....	.06½-.....
Red, dry, sck., lb.	.08 -	.08 -	.07½-.....
Lead acetate, white crys., bbl., lb.	.11 - .12	.11 - .12	.10 - .11
Lead arsenate, powd., bbl., lb.	.10 - .10½	.10 - .10½	.11 - .11½
Lime, chem., bulk, ton	8.50 -.....	8.50 -.....	8.50 -.....
Litharge, pwd., csk., lb.	.07 -.....	.07 -.....	.06½-.....
Lithophone, bags, lb.	.04 - .04½	.04 - .04½	.04½- .05
Magnesium carb., tech., bags, lb.	.06½- .06¾	.06 - .06½	.06 - .06½
Methanol, 95%, tanks, gal.	.31 -.....	.31 -.....	.31 -.....
97%, tanks, gal.	.32 -.....	.32 -.....	.32 -.....
Synthetic, tanks, gal.	.33 -.....	.33 -.....	.33 -.....
Nickel salt, double, bbl., lb.	.13 - .13½	.13 - .13½	.13 - .13½
Orange mineral, csk., lb.	.10½-.....	.10½-.....	.10½-.....
Phosphorus, red, cases, lb.	.40 - .42	.40 - .42	.40 - .42
Yellow, cases, lb.	.18 - .25	.18 - .25	.24 - .30
Potassium bichromate, casks, lb.	.08½- .09	.08½- .09	.08½- .09
Carbonate, 80-85%, calc. csk., lb.	.06½- .07	.06½- .07	.06½- .07
Chlorate, powd., lb.	nom.....	nom.....	.09½-.....
Hydroxide (c'stic potash) dr., lb.	.07 - .07½	.07 - .07½	.07 - .07½
Muriate, 80% bgs., unit.	.53½-.....	.53½-.....	.53½-.....
Nitrate, bbl., lb.	.05½- .06	.05½- .06	.05½- .06
Permanganate, drums, lb.	.18½- .19	.18½- .19	.18½- .19
Prussiate, yellow, cake, lb.	.15 - .16	.15 - .16	.15 - .16
Sal ammoniac, white, casks, lb.	.05½- .06	.05 - .05½	.05 - .05½
Salsoda, bbl., cwt.	1.00 - 1.05	1.00 - 1.05	1.00 - 1.05
Salt cake, bulk, ton	23.00 -.....	13.00 -15.00	13.00 -15.00
Soda ash, light, 58%, bags, contract, cwt.	1.05 -.....	1.05 -.....	1.05 -.....
Dense, bags, cwt.	1.10 -.....	1.10 -.....	1.10 -.....
Soda, caustic, 76%, solid, drums, cwt.	2.30 - 3.00	2.30 - 3.00	2.30 - 3.00
Acetate, works, bbl., lb.	.04 - .05	.04 - .05	.04½- .05
Bicarbonate, bbl., cwt.	1.70 - 2.00	1.70 - 2.00	1.75 - 2.00
Bichromate, casks, lb.	.06½- .07	.06½- .07	.06½- .07
Bisulphate, bulk, ton	15.00 -16.00	15.00 -16.00	15.00 -16.00
Bisulphite, bbl., lb.	.03½- .04	.03½- .04	.03½- .04
Chlorate, kegs, lb.	.06½- .06¾	.06½- .06¾	.06½- .06¾
Cyanide, cases, dom., lb.	.14 - .15	.14 - .15	.14 - .15
Fluoride, bbl., lb.	.07½- .08	.07½- .08	.07½- .08
Hyposulphite, bbl., cwt.	2.40 - 2.50	2.40 - 2.50	2.40 - 2.50
Metasilicate, bbl., cwt.	2.20 - 3.20	2.20 - 3.20	2.20 - 3.20
Nitrate, bulk, cwt.	1.45 -.....	1.35 -.....	1.45 -.....
Nitrite, casks, lb.	.06½- .07	.06½- .07	.07 - .08
Phospate, tribasic, bags, lb.	2.25 -.....	2.00 -.....	1.85 -.....
Prussiate, yel. drums, lb.	.10½- .11	.10½- .11	.09½- .10
Silicate (40° dr.) wks., cwt.	.80 - .85	.80 - .85	.80 - .85
Sulphide, fused, 60-62%, dr., lb.	.02½- .03½	.02½- .03	.02½- .03
Sulphite, crys., bbl., lb.	.02½- .02½	.02½- .02½	.02½- .02½
Sulphur, crude at mine, bulk, ton.	16.00 -.....	16.00 -.....	18.00 -.....
Chloride, dr., lb.	.03 - .04	.03 - .04	.03 - .04
Dioxide, cyl., lb.	.07 - .08	.07 - .08	.07 - .07½
Flour, bag, cwt.	1.60 - 3.00	1.60 - 3.00	1.60 - 3.00
Tin Oxide, bbl., lb.	.52 -.....	nom-.....	.50 -.....
Crystals, bbl., lb.	.40 -.....	.38½-.....	.36 -.....
Zinc, chloride, gran., bbl., lb.	.05 - .06	.05 - .06	.05 - .06
Carbonate, bbl., lb.	.14 - .15	.14 - .15	.14 - .15
Cyanide, dr., lb.	.33 - .35	.33 - .35	.33 - .35
Dust, bbl., lb.	.08½-.....	.08½-.....	.06½-.....
Zinc oxide, lead free, bag., lb.	.06½-.....	.06½-.....	.06½-.....
5% lead sulphate, bags, lb.	.06½-.....	.06½-.....	.06½-.....
Sulphate, bbl., cwt.	2.75 - 3.00	2.75 - 3.00	3.15 - 3.60

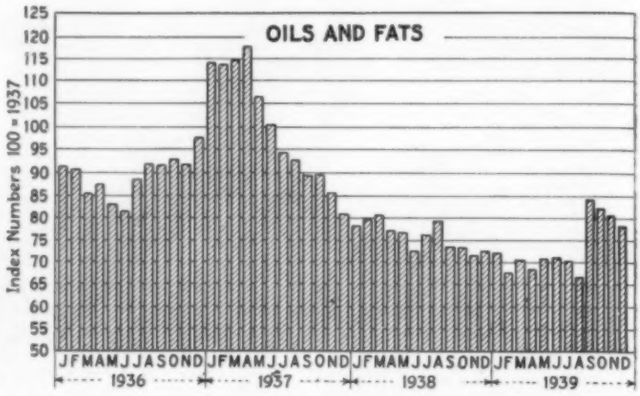
OILS AND FATS

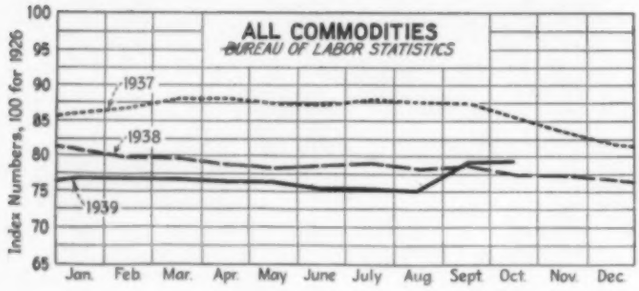
	Current Price	Last Month	Last Year
Castor oil, 3 bbl., lb.	$0.11½-$0.12	$0.10 -$0.10½	$0.09½-$0.10
Chinawood oil, bbl., lb.	.26 -.....	.27 -.....	.14½-.....
Coconut oil, Ceylon, tank, N. Y., lb.	.03¾-.....	.03¾-.....	.03¼-.....
Corn oil crude, tanks (f. o. b. mill), lb.	.05¾-.....	.05¾-.....	.06¼-.....
Cottonseed oil, crude (f. o. b. mill), tanks, lb.	.05½-.....	.05¾-.....	.06¼-.....
Linseed oil, raw car lots, bbl., lb.	.097-.....	.099-.....	.085-.....
Palm, casks, lb.	.05¼-.....	.05½-.....	.036-.....
Peanut oil, crude, tanks (mill), lb.	.06½-.....	.07 -.....	.06¼-.....
Rapeseed oil, refined, bbl., gal.	1.00 -.....	1.00 -.....	.82 -.....
Soya bean, tank, lb.	.04¾-.....	.05 -.....	.05½-.....
Sulphur (olive foots), bbl., lb.	.10 -.....	.10 -.....	.07 -.....
Cod, Newfoundland, bbl., gal.	nom.....	nom.....	.38 -.....
Menhaden, light pressed, bbl., lb.	.069-.....	.074-.....	.067-.....
Crude, tanks (f. o. b. factory), gal.	.35 -.....	.35 -.....	.30 -.....
Grease, yellow, loose, lb.	.05 -.....	.05½-.....	.05 -.....
Oleo stearine, lb.	.08½-.....	.08½-.....	.06½-.....
Oleo oil, No. 1	.08 -.....	.08 -.....	.09 -.....
Red oil, distilled, d.p. bbl., lb.	.09 -.....	.09 -.....	.07½-.....
Tallow extra, loose, lb.	.05½-.....	.06 -.....	.05½-.....

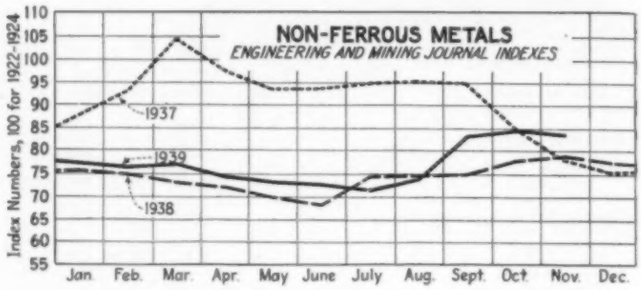
The accompanying prices refer to round lots in the New York market. Where it is the trade custom to sell f.o.b. works, quotations are given on that basis and are so designated. Prices are corrected to Dec. 13

Chem. & Met.'s Weighted Price Indexes









COAL-TAR PRODUCTS

	Current Price	Last Month	Last Year
Alpha-napthol, crude bbl., lb.	$0.52 -$0.55	$0.52 -$0.55	$0.52 -$0.55
Alpha-naphthylamine, bbl., lb.	.32 - .34	.32 - .34	.32 - .34
Aniline oil, drums, extra, lb.	.15 - .16	.15 - .16	.15 - .16
Aniline, salts, bbl., lb.	.22 - .24	.22 - .24	.22 - .24
Benzaldehyde, U.S.P., dr., lb.	.85 - .95	.85 - .95	.85 - .95
Benzidine base, bbl., lb.	.70 - .75	.70 - .75	.70 - .75
Benzoic acid, U.S.P., kgs., lb.	.54 - .56	.54 - .56	.54 - .56
Benzyl chloride, tech., dr., lb.	.23 - .25	.23 - .25	.23 - .25
Benzol, 90%, tanks, works, gal.	.20 -.....	.16 - .18	.16 - .18
Beta-napthol, tech., drums, lb.	.23 - .24	.23 - .24	.23 - .24
Cresol, U.S.P., dr., lb.	.09½- .10	.09½- .10	.10½- .11
Cresylic acid, dr., wks., gal.	.58 - .60	.58 - .60	.78 - .80
Diethylaniline, dr., lb.	.40 - .45	.40 - .45	.40 - .45
Dinitrophenol, bbl., lb.	.23 - .25	.23 - .25	.23 - .25
Dinitrotoluen, bbl., lb.	.15½- .16	.15 - .16	.15 - .16
Dip oil, 15%, dr., gal.	.23 - .25	.23 - .25	.23 - .25
Diphenylamine, bbl., lb.	.32 - .36	.32 - .36	.32 - .36
H-acid, bbl., lb.	.50 - .55	.50 - .55	.50 - .55
Naphthalene, flake, bbl., lb.	.06½- .07	.05½- .06	.05½- .06
Nitrobenzene, dr., lb.	.08 - .09	.08 - .09	.08 - .09
Para-nitraniline, bbl., lb.	.47 - .49	.47 - .49	.47 - .49
Phenol, U.S.P., drums, lb.	.13 -.....	.13 -.....	.14½-.....
Picric acid, bbl., lb.	.35 - .40	.35 - .40	.35 - .40
Pyridine, dr., gal.	1.70 - 1.80	1.55 - 1.60	1.55 - 1.60
Resorcinal, tech., kegs, lb.	.75 - .80	.75 - .80	.75 - .80
Salicylic acid, tech., bbl., lb.	.33 - .40	.33 - .40	.33 - .40
Soivent naptha, w.w., tanks, gal.	.27 -.....	.26 -.....	.26 -.....
Tolidine, bbl., lb.	.86 - .88	.86 - .88	.88 - .90
Toluene, drums, works, gal.	.30 -.....	.27 -.....	.27 -.....
Xylene, com, tanks, gal.	.27 -.....	.26 -.....	.26 -.....

MISCELLANEOUS

	Current Price	Last Month	Last Year
Barytes, grd., white, bbl., ton.	$22.00-$25.00	$22.00-$25.00	$22.00-$25.00
Casein, tech., bbl., lb.	.17 - .22	.20 - .22	.08 - .11
China clay, dom., f.o.b. mine, ton.	8.00 -20.00	8.00 -20.00	8.00 -20.00
Dry colors			
Carbon gas, black (wks.), lb.	.02½- .30	.02½- .30	.02½- .30
Prussian blue, bbl., lb.	.36 - .37	.36 - .37	.36 - .37
Ultramarine blue, bbl., lb.	.11 - .26	.10 - .26	.10 - .26
Chrome green, bbl., lb.	.21½- .30	.21 - .30	.21 - .27
Carmine red, tins, lb.	4.85 - 5.00	4.85 - 5.00	4.00 - 4.40
Para toner, lb.	.75 - .80	.75 - .80	.75 - .80
Vermilion, English, bbl., lb.	2.45 - 2.60	2.70 - 2.90	1.50 - 1.55
Chrome yellow, C.P., bbl., lb.	.14½- .15½	.14½- .15½	.14½- .15½
Feldspar, No. 1 (f.o.b. N.C.), ton.	6.50 - 7.50	6.50 - 7.50	6.50 - 7.50
Graphite, Ceylon, lump, bbl., lb.	.06 - .06½	.06 - .06½	.06 - .06½
Gum copal Congo, bags, lb.	.08 - .30	.07 - .30	.06 - .30
Manila, bags, lb.	.09 - .15	.08 - .14	.09 - .14
Damar, Batavia, cases, lb.	.10 - .22	.08 - .20	.08 - .24
Kauri cases, lb.	.18 - .60	.18 - .60	.18½- .60
Kieselguhr (f.o.b. N. Y.), ton.	50.00 -55.00	50.00 -55.00	50.00 -55.00
Magnesite, calc, ton.	50.00 -.....	50.00 -.....	50.00 -.....
Pumice stone, lump, bbl., lb.	.05 - .07	.05 - .08	.05 - .07
Imported, casks, lb.	.03 - .04	.03 - .04	.03 - .04
Rosin, H., bbl.	6.75 -.....	6.85 -.....	5.75 -.....
Turpentine, gal.	.32½-.....	.31½-.....	.27½-.....
Shellac, orange, fine, bags, lb.	.27 -.....	.25 -.....	.20 -.....
Bleached, bonedry, bags, lb.	.25 -.....	.24 -.....	.19 -.....
T. N. Bags, lb.	.20 -.....	.16 -.....	.10½-.....
Soapstone (f.o.b. Vt.), bags, ton.	10.00 -12.00	10.00 -12.00	10.00 -12.00
Talc, 200 mesh (f.o.b. Vt.), ton.	8.00 - 8.50	8.00 - 8.50	8.00 - 8.50
300 mesh (f.o.b. Ga.), ton.	7.50 -10.00	7.50 -10.00	7.50 -11.00
225 mesh (f.o.b. N. Y.), ton.	13.75 -.....	13.75 -.....	13.75 -.....

INDUSTRIAL NOTES

WORTHINGTON PUMP AND MACHINERY CORP., Harrison, N. J., has elected Maynard D. Church as a vice-president and R. W. Towne as assistant secretary.

CORNING GLASS WORKS, Corning, N. Y., has issued contract for a new laboratory and pilot plant.

ALLEGHENY LUDLUM STEEL CORP., Pittsburgh, has appointed C. H. Vaughan as representative in the southeastern states with headquarters at Birmingham, Ala.

PENNSYLVANIA SALT MFG. CO., Philadelphia has acquired the assets of the Sterling Products Co. of Easton, Pa. Fred Prince will head the newly organized laundry and dry cleaning division; J. Stanley Hall will be assistant manager of eastern territories and Gilbert H. Corbin assistant manager of western territories.

READ MACHINERY CO, INC., York, Pa., has broken ground for an addition to its plant and will install new precision machine tool equipment.

NITRATE AGENCIES CO., New York, has changed its name to Naco Fertilizer Co. with the corporate setup and personnel unchanged.

DURAKOOL, INC., Elkhart, Ind., are now represented in the New York territory by K. I. Clisby & Co., 74 Trinity Place.

AMERICAN LOCOMOTIVE CO., New York, has placed C. S. Patton in charge of sales of the Alco Products Division.

ANSBACHER SIEGLE CORP., New York, is installing a modern continuous unit for the production of lead and calcium arsenates.

CUTLER-HAMMER, INC., Milwaukee, has placed Clayton P. Innes in charge of sales in the Omaha territory.

New CONSTRUCTION

	Current Projects		Cumulative 1939	
	Proposed Work	Contracts	Proposed Work	Contracts
New England	$40,000	$205,000	$1,375,000	$3,058,000
Middle Atlantic	2,355,000	6,710,000	8,870,000	21,487,000
South	4,000,000	25,000	16,533,000	12,505,000
Middle West	270,000	220,000	16,215,000	16,800,000
West of Mississippi	150,000	4,630,000	16,095,000	19,471,000
Far West	35,000	.....	2,370,000	3,472,000
Canada	50,000	.....	9,010,000	5,455,000
Total	$6,900,000	$11,790,000	$70,468,000	$82,248,000

PROPOSED WORK

Cement Plant—Lone Star Cement Co., Manchester, Tex., plans to modernize its plant here. $150,000.

Chemical Plant—Chemicals, Inc., c/o H. C. Baumann, Archt., 251 Kearney St., San Francisco, Calif., plans to construct chemical plant and warehouse at Oakland, Calif. Bids are now being received by architect. $35,000.

Chemical Plant—Lodi Chemical Co., 500 Fifth Ave., New York, N. Y., plans to rebuild its plant at Lodi, N. J., recently destroyed by fire. $50,000.

Gas Pipe Line—West Michigan Consumers Co., J. L. Robinson, Mgr., Muskegon, Mich., plans to construct 20 mi. of 8 in. gas pipe line between Muskegon and Ravenna. $90,000.

Gypsum Plant—National Gypsum Co., 190 Delaware Ave., Buffalo, N. Y., plans to build an extension to its plant at Oak Pt. Ave. and Cabot St., New York, N. Y. $2,000,000.

Absorption Plant—Pent-Hex Corp., affiliated with West Michigan Consumers Co., Muskegon, Mich., plans to construct absorption plant to convert casing-head gas into high Octane gasoline. $100,000.

Crude Oil Refinery—Crew-Levick Co., 400 North Broad St., Philadelphia, Pa., (subsidiary of Cities Service Co., New York, N. Y.) plans additions, alterations and improvements at its refinery at Titusville, Pa. C. E. Kinder, Supt. Cost will exceed $65,000.

Ethyl Gasoline Plant—Ethyl Gasoline Corp., Jackson Rd., Baton Rouge, La., plans to construct an anti-knock or Ethyl gasoline plant here. $3,500,000.

Natural Gas Development—Belmont Quadrangle Drilling Corp., Frank Brewster, Pres. & Mgr., P. O. Box 373, Bradford, Pa., plans extensive development of Oriskany sand natural gas areas in Steuben and Allegany Counties, N. Y. Contract for drilling unspecified number of 5000 ft. wells, each requiring 4,000 ft. or more of 6¼ in. pipe awarded to H. J. Stroupe & Son, Coudersport, Pa., and Acme Drilling Co., Tioga, Pa. Total estimated cost over $50,000.

Natural Gas Development—Godfrey L. Cabot, Inc., Cabot Bldg., Wellsville, N. Y., plans extensive development of Oriskany sand natural gas area in Steuben, Allegany and Tompkins Counties, N. Y., and Tioga and Potter Counties, Pa., including drilling large number of 5,000 ft. wells each requiring 4,000 ft. or more of 6¼ in. pipe. C. K. Whorton, c/o Owner, Engr. $100,000.

Natural Gas Development—Empire Gas Co., c/o Empire Gas & Fuel Co., Ltd., Wellsville, N. Y., plans extensive development of Oriskany sand natural gas area near Millport, Pa., including drilling unspecified number of 5,000 ft. wells each requiring 4,000 ft. or more of 6¼ in. pipe. Contract for drilling wells awarded to Harder & Mitchell, Shinglehouse, Pa. J. Bradley, c/o Owner, Engr. Total estimated cost over $40,000.

Natural Gas Development—New Penn Development Co., c/o North Penn Gas Co., Port Allegany, Pa., J. Isherwood in charge, plans extensive development of Oriskany sand gas producing area in Sharon Township, Potter Co., Pa., including drilling unspecified number of 5,000 to 6,000 ft. wells each requiring about 4,000 ft. of 6¼ in. pipe. $50,000.

Petroleum Refinery—Argo Petroleum, Ltd., Leaside, Ont., Can., plans to construct an addition to its plant on Industrial St., Toronto, Ont., Can. $50,000.

Rubber Factory—Pyramid Rubber Co., Ravenna, O., plans to construct a 1 story, 60x90 ft. addition to its plant on Prospect St., Ravenna. $40,000.

Brine Tank—Diamond Crystal Salt Co., subsidiary of General Foods Sales Co., 250 Park Ave., New York, N. Y., plans to construct a 600,000 gal. brine tank at St. Clair, Mich.

Storage Plant—Shell Union Oil Corp., 50 West 50th St., New York, N. Y., plans to construct a storage plant consisting of 20 steel storage tanks, at West Boylston, Mass.

Sugar Refinery—United States Sugar Corp., C. R. Bitting, Pres., 20 Exchange Pl., New York, N. Y., plans to construct refinery to grind 6,000 tons sugar cane per day, in Florida. Site has not been selected yet but will be located in Florida Everglades. $500,000.

CONTRACTS AWARDED

Castor Oil Factory—Baker Castor Oil Co., 120 Bway., New York, N. Y., has awarded the contract for a 2½ story, 42x60 ft. factory at Bayonne, N. J., to James Mitchell, Inc., 575 Westside Ave., Jersey City, N. J.

Chemical Plant—Pennsylvania Industrial Chemical Co., R. W. Ostermeyer in charge, State St., Clairton, Pa., is awarding separate contracts for a 2 story plant. $40,000.

Factory—Air Reduction Sales Co., 1216 West 69th St., Cleveland, O., has awarded the contract for an addition to its factory to A. M. Higley Co., 2036 East 22 St., Cleveland. $40,000.

Factory—E. I. duPont de Nemours & Co., Inc., Wilmington, Del., will build an addition to its plant at Edgemoor, Del. Work will be done by owner. Cost will exceed $1,000,000.

Factory—Eastman Kodak Co., Kodak Park, Rochester, N. Y., has awarded the contract for an addition to Building No. 25 to Ridge Construction Co., Kodak Park. $40,000.

Factory—Johnson & Johnson, 500 George St., New Brunswick, N. J., have awarded contract for a 1 story, 300x600 ft. factory to White Construction Co., 95 Madison Ave., New York, N. Y. $800,000.

Laboratory—Bell Telephone Laboratories, Inc., 463 West St., New York, N. Y., has awarded the contract for a laboratory on Mountain Ave., Murray Hill, N. J., to John Lowry, Inc., 630 Fifth Ave., New York, N. Y. $3,000,000.

Laboratory—Monsanto Chemical Co., 600 Worcester St., Springfield, Mass., has awarded contract for laboratory at Indian Orchard, Mass., to Adams & Ruxton Construction Co., 1387 Main St., Springfield, Mass. $125,000.

Metallurgical Laboratory — Youngstown Sheet & Tube Co., East Chicago, Ind., has awarded the contract for a laboratory to J. F. Rahn, 500 West 150th St., East Chicago. $100,000.

Research Laboratory—Cummins Engine Co., Columbus, Ind., has awarded contract for research a. d development laboratory to Austin Co., 16110 Euclid Ave., Cleveland, O. $40,000.

Absorption Plant—El Paso Natural Gas Co., c/o C. C. Crogin, Bassett Tower, El Paso, Tex., will construct a gasoline absorption plant at Jal, N. M. Work will be done by company forces. $1,000,000.

Catalytic Plant—Catalytic Development Co., 1608 Walnut St., Philadelphia, Pa., has awarded the contract for 5 industrial buildings to H. E. Baton, 1713 Sansome St., Philadelphia. $40,000.

Gasoline Plant—Gulf Oil Corp., P. H. Marble, constr. supt., Port Arthur, Tex., has awarded the contract for an aviation gasoline plant to Lummus Co., 420 Lexington Ave., New York, N. Y. $300,000.

Gasoline Terminal—Elk Refining Co., Kanawha Valley Bank Bldg., Charleston, W. Va., will buid a gasoline and kerosene marine terminal, dock, pipe lines, pumping equipment, etc., at Charleston. Work will be done by separate contracts and own forces. $25,000.

Oil Refinery—Humble Oil & Refining Co., Ingleside, Tex., has awarded contract for alterations and extensions to refinery to Brown & Root, Corpus Christi, Tex. $325,000.

Oil Refinery—King Oil Co., c/o M. Palmer, Archt., 36 South State St., Chicago, Ill., has awarded contract for refinery to Welso Construction Co., 2233 West Grand Ave., Chicago. Cost including equipment $40,000.

Oil Refinery—Pennsylvania Refining Co., W. W. Beck, Gen. Mgr., Butler, Pa., is building additions to its refinery at Titusville, Pa. Work is being done by separate contracts under supervision of owner's engineering department. $70,000.

Oil Refinery—Talco Asphalt & Refining Co. & Associates, Dallas and Mt. Pleasant, Tex., will enlarge refinery at Mt. Pleasant to convert crude oil into asphalt and road oil. Work will be done under purchase and hire plan. $80,000.

Paper Plant—Pollock Paper & Box Co., L. L. Jacobs, Vice Pres., 2236 South Lamar St., Dallas, Tex., is building a plant at Houston, Tex. Work is being done by day labor and separate contracts. $250,000.

Pipe Line—Magnolia Pipe Line Co., Longview and Beaumont, Tex., is building an 85 mi. pipe line in the western part of Jackson Co. Work is being done by "purchase and hire" plan. $90,000.

Pipe Line—Valley Pipe Line Co., McAllen, Tex., is building 25 mi. crude oil pipe line in Starr, Brooks and Hidalgo Counties. Work is being done by "purchase and hire" plan. $45,000.

Potash Minerals Plant — International Agricultural Corp., 61 Bway., New York, N. Y., will construct production plant for mining and processing of potash minerals at Carlsbad, N. M. Work will be done by separate contracts. $2,500,000.

Salt Brine Project—Niagara Brine Co., Inc., c/o Ford, Bacon & Davis, Cons. Engrs., 39 Bway., New York, N. Y., will construct salt brine project at Linden, N. Y. Work will be done by own forces. $1,500,000.

Sulphite Mill—Hudson Pulp & Paper Corp., Maple St., Augusta, Me., has awarded contract for rebuilding sulphite mill recently damaged by fire to James Leck & Co., 211 South 11th St., Minneapolis, Minn.

Tile Factory—Olean Tile Co., East State St., Olean, N. Y., has awarded the contract for a 1 story addition to its factory to F. T. Coughlin, 230 North Third St., Olean. Cost including equipment $40,000.

Storage Building—Brockway Glass Co., 7th Ave., Brockway, Pa., will construct a 1 story storage building. Work will be done by day labor.

Storage Plant—Shell Union Oil Corp., 50 West 50th St., New York, N. Y., has awarded the contract for oil storage plant including 8 steel storage tanks on Waverly Oaks Rd., Waltham, Mass., to Chicago Bridge & Iron Co., 250 Stuart St., Boston. $40,000.

Warehouse—General Tire Co. of New York, 642 West 57th St., New York, N. Y., has awarded the contract for a warehouse and shipping plant to Christensen Engineering Co., Inc., 101 Park Ave., New York, N. Y. $100,000.

Warehouse—Hunkins-Willis Lime & Cement Co., 4480 Duncan Ave., St. Louis, Mo., is building a warehouse and office building on sub-contract basis. $40,000.

PRODUCERS INCREASE POTASH OUTPUTS AND RESERVE SUPPLIES FOR DOMESTIC CONSUMERS

JUST as the world war brought into prominence our dependence upon outside countries for our supply of potash, and thereby stimulated efforts to develop a home industry, so the present war in Europe has called attention to the fact that the home output is not yet self-sufficient and has inaugurated plans which will make it more nearly so. Domestic production of potash has been progressively increasing since 1922 and in 1938 is estimated to have taken care of about 55 per cent of domestic requirements.

With the elimination of imports from Germany in the last three months there arose some uncertainty regarding the probability of obtaining future supplies in ample volume. This uncertainty was heightened by the fact that some of the refined salts, including muriate and sulphate were in a sold-up condition and contract holders of foreign grades were faced with the necessity of finding new suppliers. Some of the salts which depend on muriate as a raw material also were difficult to obtain partly because imports had been curtailed and partly because muriate was not available to permit of the necessary increase in home production.

Since September considerable thought has been given to the adjustments which this situation demanded. In recent weeks, different reports have been heard which give assurance that steps are being taken to enlarge production. New production, higher rates of operation at existing works, and leasing of more potash-bearing lands have figured in these reports. Hence, as a direct result of present hostilities, it is probable that our potash industry will increase at a more-than-normal pace and that at least a part of the increase will be maintained when ocean transportation returns to normal. This will also hold true for some of the chemical salts which hitherto have been imported in toto or for which our markets were divided between imported and domestic offerings.

In the meantime, foreign sources of supply continue to hold out encouragement. In 1938, our imports from France included 33,880 tons of muriate and 9,353 tons of sulphate. Arrangements are well advanced to continue shipments of French potash to this country. Spain also offers promise of entering the market although mining operations in that country have been disappointing to date.

Domestic consumers likewise will be given the preference in the distribution of production. This is assured by the announcement that producers will not sell in the export trade in order to conserve stocks for home consumption. Leading producers formed an export association last year and considerable effort has been expended in developing export markets. The manager of the association has issued the following announcement:

"The Potash Export Association, Inc. was formed in 1938 under the Export Trade Act for the purpose of distributing the export tonnage of American potash producers, and has been actively so engaged during the past year.

"Since the outbreak of the European war, the Association has received many urgent appeals for potash from all over the world, and no doubt much of the export business offered could be obtained at attractive prices.

"However, the situation in the United States imposed by the war has caused the member companies of this Association to decide that they should refrain from sending potash abroad until the quantity needed for domestic consumption has been supplied.

"Therefore, at the present time, and until the return of more normal conditions, the Potash Export Association has no available tonnage to offer for export."

The American Potash Institute, Inc. announces that deliveries of agricultural potash by its member companies within the continental United States, Canada, Cuba, Puerto Rico, and Hawaii during the third quarter of this year amounted to 120,350 tons of actual K_2O, equivalent to 218,437 tons of potash salts. Constituting this total were 176,946 tons of muriate, 3,339 tons of manure salts, 23,493 tons of sulphate, 5,160 tons of kainit, and 9,499 tons of sulphate of potash-magnesia. In addition, deliveries for chemical uses amounted to 9,788 tons of salts equivalent to 5,968 tons of K_2O.

Potash Deliveries
Short Tons K_2O
(United States, Canada, Cuba, Hawaii, Puerto Rico)

	Jan.-Sept. 1939	Jan.-Sept. 1938
Muriate	135,553	185,681
Manure Salts	1,459	4,868
Kainit 20 + 14%	2,726	8,554
Sulphate	15,658	19,079
Sulphate-Potash-Magnesia	3,450	1,826
Total Agr.	158,846	220,008
Chemical Potash	16,877	10,643
GRAND TOTAL	175,723	230,651
Northeast-Middle Atlantic States	34,017	49,970
Southern (including Va.)	71,562	100,687
Mid-Western	24,804	29,961
West Coast	2,489	4,667
Canada, Puerto Rico, Cuba, Hawaii	25,974	34,723
TOTAL AGR.	158,846	220,008

These figures include salts of domestic and foreign origin, exclusive of importations of potassium nitrate.

In terms of regional consignments, the total of 100,889 tons K_2O delivered within the continental United States was shipped as follows: Northeastern and Mid-Atlantic States 28,462 tons; Southern States (including Virginia) 53,585 tons; Midwestern States 17,207 tons; and West Coast States 1,635 tons. The balance of 19,461 tons K_2O was delivered to Canada, Cuba, Puerto Rico and Hawaii.

For the first nine months of 1939 deliveries of agricultural K_2O amounted to 158,846 tons, equivalent to 293,631 tons of potash salts, consisting of 230,902 tons Muriate; 4,876 tons Manure Salts, 31,562 tons Sulphate; 13,849 tons Kainit; and 12,442 tons of Sulphate of Potash Magnesia. Regional distribution on a K_2O basis was as follows: Northeastern and Mid-Atlantic States, 34,017 tons; Southern States (Virginia included) 71,562 tons; Midwestern States, 24,804 tons; West Coast States 2,489 tons; the remainder, 25,974 tons K_2O was delivered to Canada, Cuba, Puerto Rico, and Hawaii. In addition, deliveries for chemical uses amounted to 27,674 tons of salts equivalent to 16,877 tons of K_2O. These figures, it will be observed, relate to deliveries, not consumption of potash salts.

Pennsylvania Salt Will Build New Plant

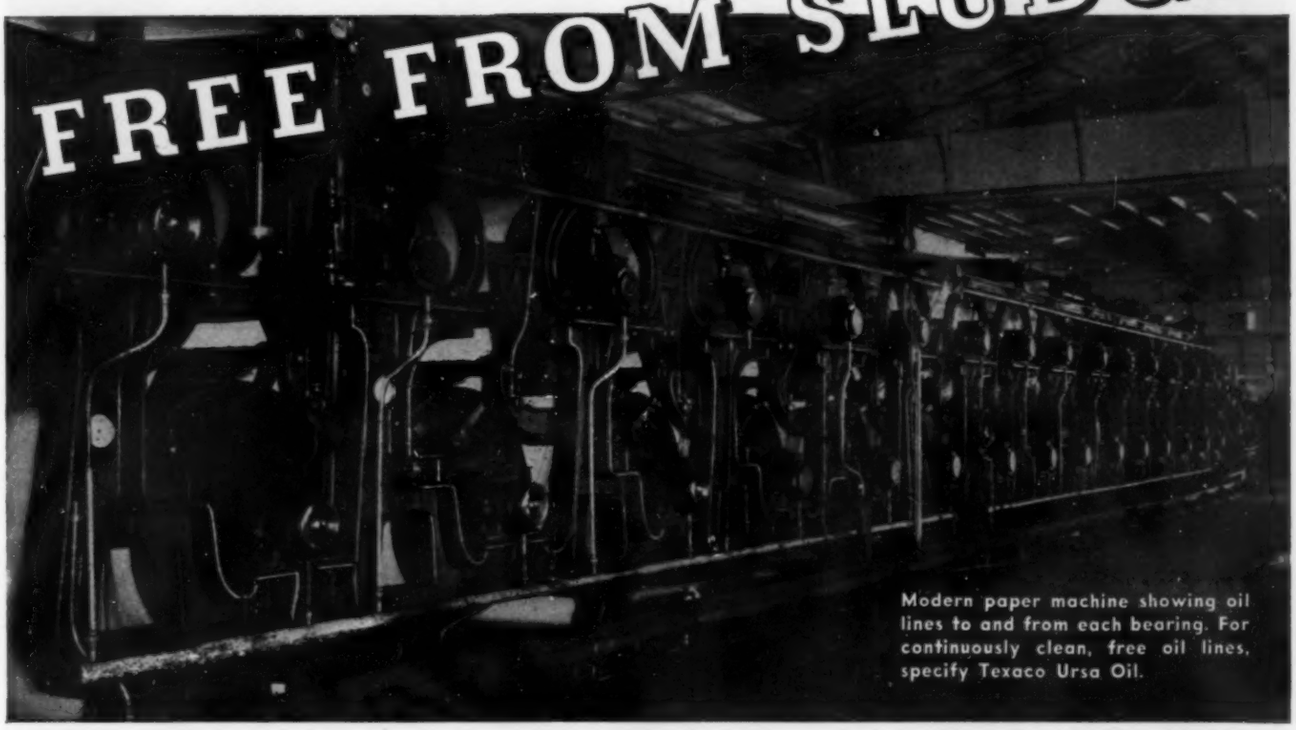
After nearly three-quarters of a century on its present site in Philadelphia, the Pennsylvania Salt Manufacturing Co. announces that it is moving its Philadelphia plant to a new location more suitable for an expansion program planned for some time, according to statement by Leonard T. Beale, president of that company.

In making this statement Mr. Beale said: "The sale recently made of its 62-acre waterfront property at Delaware & Oregon Avenues, said to be the largest real estate transaction in Philadelphia in ten years, is the first step of the Pennsylvania Salt Manufacturing Co. in its plans to relocate its Philadelphia plant operations to provide more suitable manufacturing facilities.

"Our Philadelphia plant is one of our manufacturing units extending from coast to coast which produce various heavy chemical products and specialties. For some time we have felt that our Philadelphia property at Delaware and Oregon Avenues was unsuitable for our expansion program. We have therefore decided to relocate our Philadelphia operations on a new site in the metropolitan area where more adequate space and facilities will enable us to produce new products now under development, in addition to continuing the production of certain chemicals now being made at our Philadelphia plant."

Oil Circulating Systems

FREE FROM SLUDGE



Modern paper machine showing oil lines to and from each bearing. For continuously clean, free oil lines, specify Texaco Ursa Oil.

TEXACO URSA OIL assures clean oil lines month after month in oil circulating systems because it resists breaking down in the presence of high temperatures and bearing pressures.

Experienced lubrication engineers, trained in the selection and application of Texaco Lubricants, will be glad to demonstrate that savings can be made with Texaco Perfected Lubrication.

For prompt engineering service and deliveries, phone the nearest of our 2279 warehouses in the U.S., or write: The Texas Company, 135 E. 42nd St., New York, N. Y.

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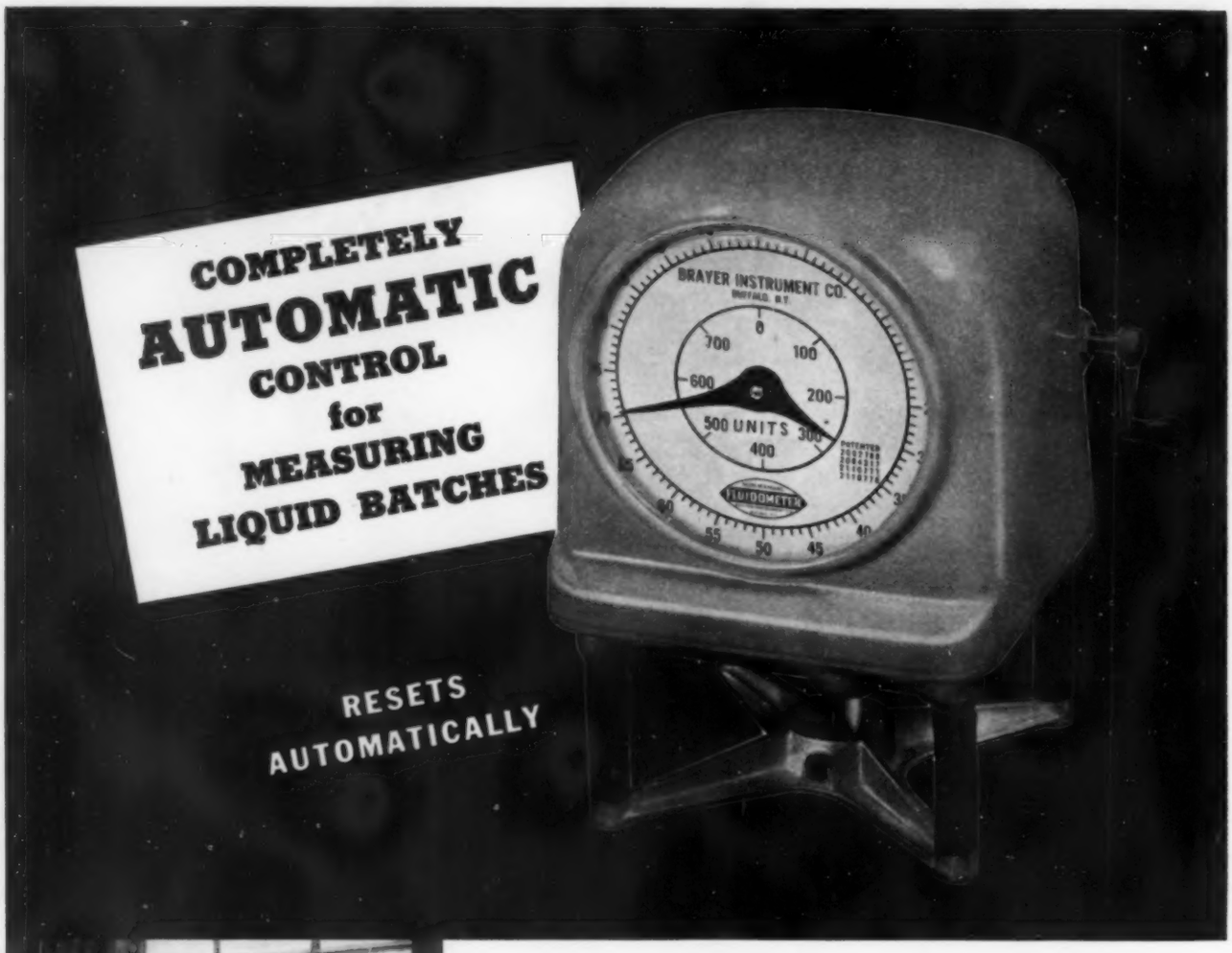
Texaco Dealers invite you to tune in The Texaco Star Theatre—a full hour of all-star entertainment—Every Wednesday Night—Columbia Network—9:00 E.S.T., 8:00 C.S.T., 7:00 M.S.T., 6:00 P.S.T.

40-PAGE BOOKLET devoted to lubrication practices in the paper industry, free for the asking. Drop us a postal for a copy.

TEXACO Ursa Oils



View of Fluidometer System used to gauge water for concrete batches by the Buffalo Gravel Corp., Buffalo, N. Y.

The Fluidometer System permits economical, efficient operation at the Rochester, New York, asphalt plant.

The FLUIDOMETER

DEPENDABLE NON-MANUAL LIQUID METERING SYSTEM

The Fluidometer System is a simple, dependable, completely automatic system which gives precision accuracy in the batching of liquids. It is adaptable to practically every liquid measuring requirement of industry, and is equally accurate on liquids of either high or low viscosity.

The remarkable Control Unit or "Brass Brain" of the Fluidometer System permits speedy, accurate, non-manual measurement. Production is accelerated, output increased, and waste reduced. Appreciable savings are effected by releasing operators for other duties.

The "Brass Brain" may be placed near the meter or remote from it. The entire System can be started from a central control position by button, relay or photo-electric cell. *Automatic resetting* allows predetermined quantities to be delivered when desired without further setting.

WRITE FOR BULLETIN GIVING COMPLETE DESCRIPTION

BRAYER INSTRUMENT COMPANY
1615 WILLIAM STREET BUFFALO, NEW YORK

NON-MANUAL FLUIDOMETER BRAYER INSTRUMENT CO. BUFFALO, N.Y.

its for you mr. Operator—

a new MULTI-STAGE FINE REDUCTION CRUSHER

★ MULTI-STAGE BELL HEAD AND CURVED CONCAVES
★ QUICK AND EASY ADJUSTMENT
★ SHOCK ABSORBER SUSPENSION
★ ABSOLUTE DUST PROTECTION
★ AUTOMATIC LUBRICATION
★ ROLLER-BEARING COUNTER-SHAFT

WRITE FOR BULLETIN 113

TRAYLOR-STEARNS PATENTS

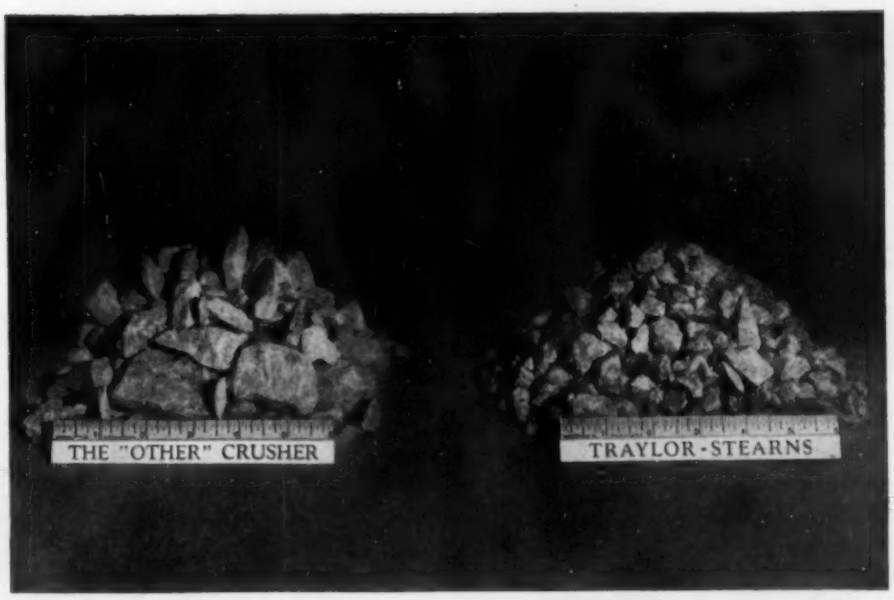
CRUSHES FINER AT GREATER CAPACITY WITH LESS POWER

PRODUCT IS CUBICAL-NO SLABS, MINIMUM OVERSIZE

POSITIVELY NON-CHOKABLE

PROOF POSITIVE!

The photo shows two samples of crushed trap rock, taken WITHOUT SELECTION from outflowing streams of finished output. To the left is the product of a 4'0" reduction crusher, (not a Traylor), extensively used, and at right that of a 3'0" TRAYLOR-STEARNS MULTI-STAGE FINE REDUCTION CRUSHER. Both crushers had a feed of THRU 1⅞" ON ⅞", a very slabby product of a secondary crusher. Both crushers were set to 5/16" closed side of discharge. The TRAYLOR-STEARNS had an output of 60 tons per hour and the "other" crusher 45 tons per hour. The TRAYLOR-STEARNS product contained 42.2% THRU ⅜", square holes, while the "other" crusher product contained 24.3% THRU ⅜", square holes. The TRAYLOR-STEARNS used one H.P. per ton of product and the "other" crusher one and one-third H.P. per ton of product.



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ALLENTOWN, PENNA. U.S.A.

Check Corrosion WITH "Buffalo" Special Fans

Special metal type "R" Fan.

● Many a plant manager has made a real saving by installing a BUFFALO Fan—built specially to combat the particular problem with which he was faced.

● With sixty-one years' experience in the fan business, BUFFALO engineers are competent to recommend the type of fan and kind of metal which will give you best results. And remember, for all those highly corrosive fumes where RUBBER is the logical choice—BUFFALO has fans lined by the B. F. Goodrich Vulcalock Process.

WRITE FOR DETAILS

● *Why not write us today? Tell us what fumes you are handling, quantity of air per minute. We'll recommend the right equipment and give you prices. No obligation.*

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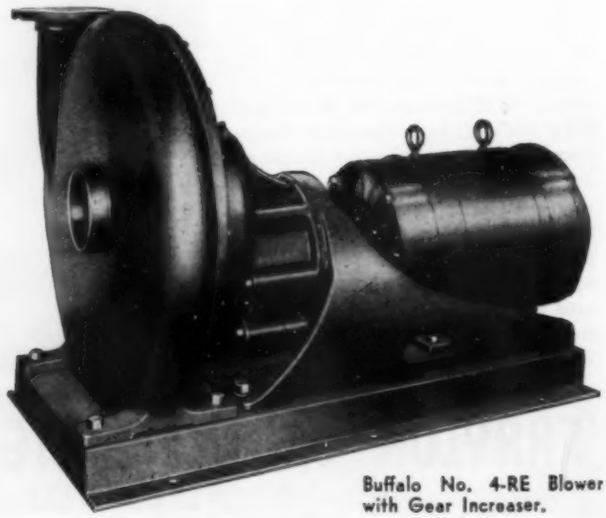
501 Broadway, Buffalo, N. Y.

Branch Engineering Offices in Principal Cities
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Buffalo No. 5-E Exhauster showing Flanged Inlet and Outlet.



Buffalo No. 4-RE Blower with Gear Increaser.

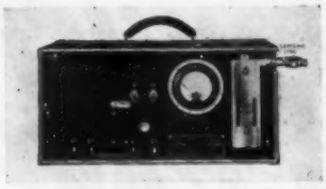
M.S.A GAS INDICATING and DETECTING INSTRUMENTS

FOR EVERY CHEMICAL PROCESSING REQUIREMENT

M. S. A. EXPLOSIMETER

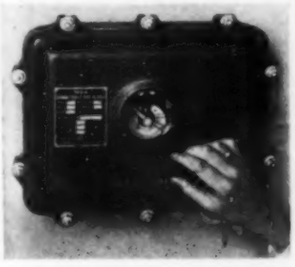
This low-priced, pocket-size combustible gas indicator tells you of explosion danger at the working place—easily, instantly, accurately—and is so simple to operate that any average workman can use it. Direct-reading meter indicates flammable gas concentrations in percent of the lower explosive limit; comparative readings above or within the explosive range are obtained with a dilution tube. Write for Bulletin No. DN-1.

M. S. A. CARBON MONOXIDE INDICATOR



Continuously indicates CO concentrations from 0 to .15% in air (the dial can be read to .005% and estimated to .001%). The Indicator is compact and portable, reliably accurate, and is particularly adapted to surveys of atmospheres in plants, vehicles and aircraft, and in checking furnace operations, burner installations, etc. Operation is from self-contained Edison cells or any outside 6 volt, A.C. or D.C. power source. Also available in hand-operated model eliminating necessity of electric power supply. Bulletin No. DS-1.

M. S. A. COMBUSTIBLE GAS ALARM



Electrically warns, or operates controls whenever gas concentration reaches any pre-selected point between 10% and 100% of lower explosive limit. Designed for permanent installation and continuous 24-hour-a-day service. Alarm is accurate, sensitive. May be used with individual calibration for practically all flammable gases or vapors. Can be modified to test from four, six, or eight places, or to produce a continuous graphic record of gas concentrations. Bulletin No. DT-1.

M. S. A. HYDROCYANIC ACID GAS DETECTOR

A mutual development of the laboratories of M.S.A. and E. I. DuPont de Nemours and Co., Inc., this unique instrument provides accurate and simple determination of HCN wherever the hazard is encountered. Small, light and convenient to carry, the instrument indicates actual HCN concentration in air from 0.005% to 0.10% by volume, furnishing accurate measurements in less than two minutes. Any workman can use the Detector, in checking questionable atmospheres before release of fumigated materials or reoccupation of fumigated areas, etc. Bulletin No. DZ-1.

M. S. A. CARBON MONOXIDE DETECTOR

Portable, hand-operated, U. S. Bureau of Mines-approved. May be carried and used wherever CO is a potential hazard, indicating presence of the gas in concentrations in excess of .05%. Positive, simple and practical, the Detector operates by squeezing a bulb which forces air through tube of chemical which changes color in direct proportion to amount of CO in air. Comparison with standard color tube determines CO concentration. Instrument and 12 detector tubes are contained in sturdy carrying case. Bulletin No. BF-1.

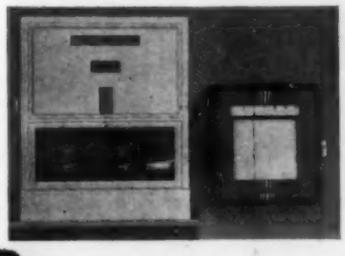
M. S. A. HYDROGEN SULPHIDE DETECTOR

The only available instrument of its kind, the M.S.A. H_2S Detector is invaluable for rapid and accurate detection and measurement of low but dangerous concentrations of this highly toxic gas-on-the-job. Hand operated, light, compact and easily carried, the unit indicates H_2S concentrations from .0025% to .04% by volume. Anyone can use it, in the many fields where hydrogen sulphide occurs. Bulletin No. DY-2.

M. S. A. CARBON MONOXIDE ALARM

Electrically operated, this exclusive M.S.A. development constantly samples air where men are working—instantly sounding a loud warning whenever carbon monoxide concentration exceeds the safe limit of 0.02%. The instrument is durable, self-contained, requires little maintenance; it is arranged for wall mounting and operates from regular A.C. or D.C. 110 volt circuit. Model for automatic control of ventilating equipment also available. Bulletin No. DR-1.

M. S. A. OXYGEN RECORDER



The new M.S.A. Oxygen Recorder continuously analyzes and records concentrations of oxygen in gaseous mixtures. Can be supplied to analyze ranges of 0 to 1%; to 0 to 15%. Used in chemical processes; measurement of excess air in product of combustion from burners; measurement of oxygen in natural and manufactured gases, etc. Full details of this latest development of M.S.A. Research are contained in Bulletin No. DW-1.

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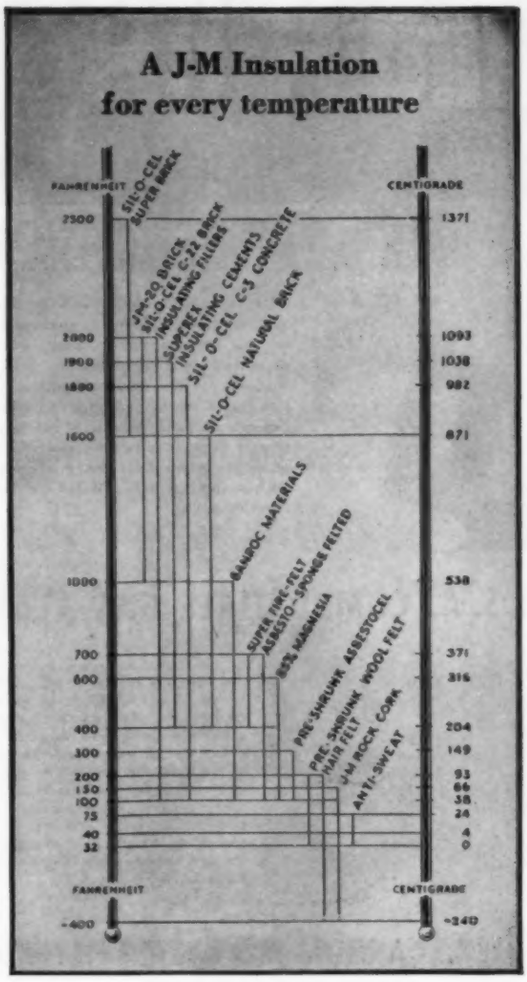

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For every temperature . . .
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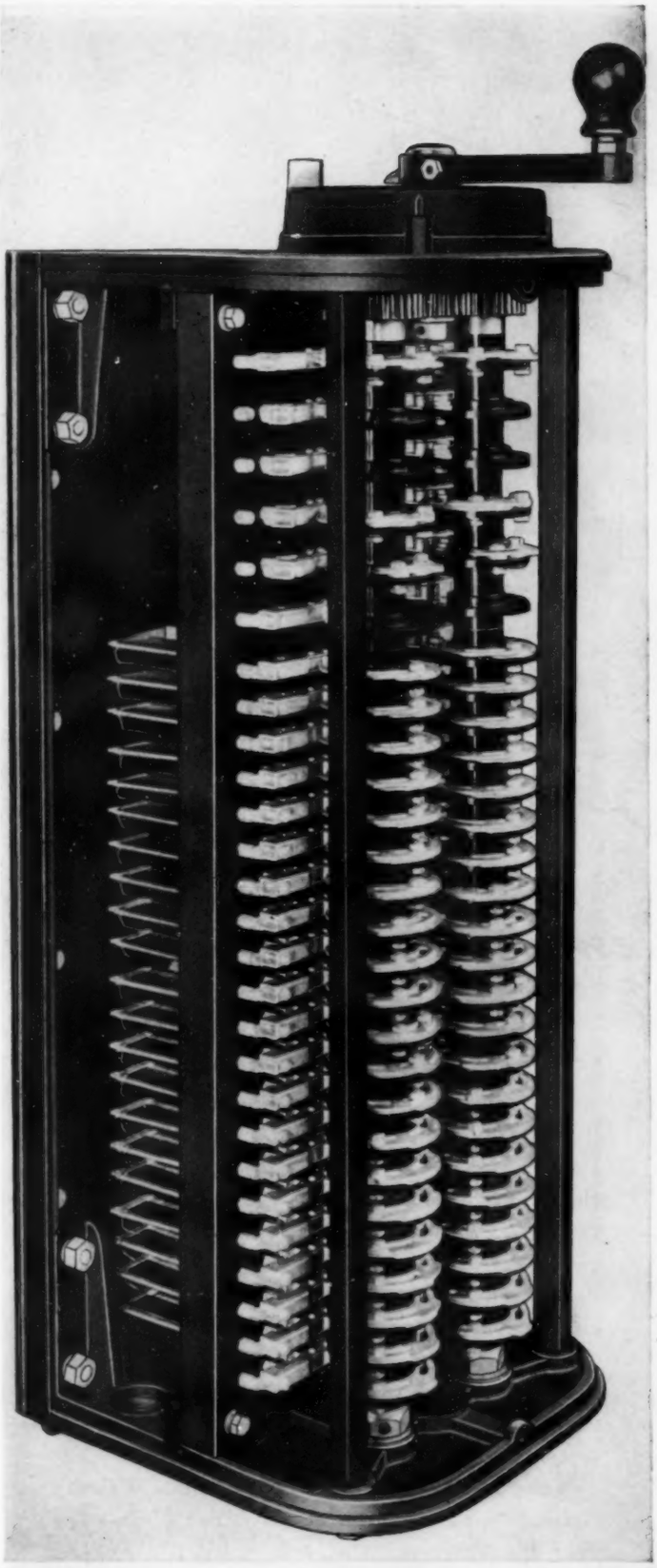

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SPECIAL BULLETIN 101 NON-REVERSING RUBBER MILL DUAL VOLTAGE GRAND MASTER CONTROLLER

- It operates manual reversing magnetic control equipment for two 125 HP, 115/230 Volt, DC, Rubber Calender Motors, and provides for operating these motors in tandem over the 2/1 speed range on either voltage.
- It provides 21 speed control points on either voltage by field control.
- It employs Cam operated contacts, for both control circuits and field points, and uses unit Type Grid Resistors for field resistance.
- Contact finger assemblies are interchangeable with Bulletin 101 Type R D Heavy Duty Mill Master Switch, Bulletin 101 Type F R Foot Switch, Bulletin 102 Type C L Cam Limit Switch, and Bulletin 102 Type H L Hatchway Limit Switch.
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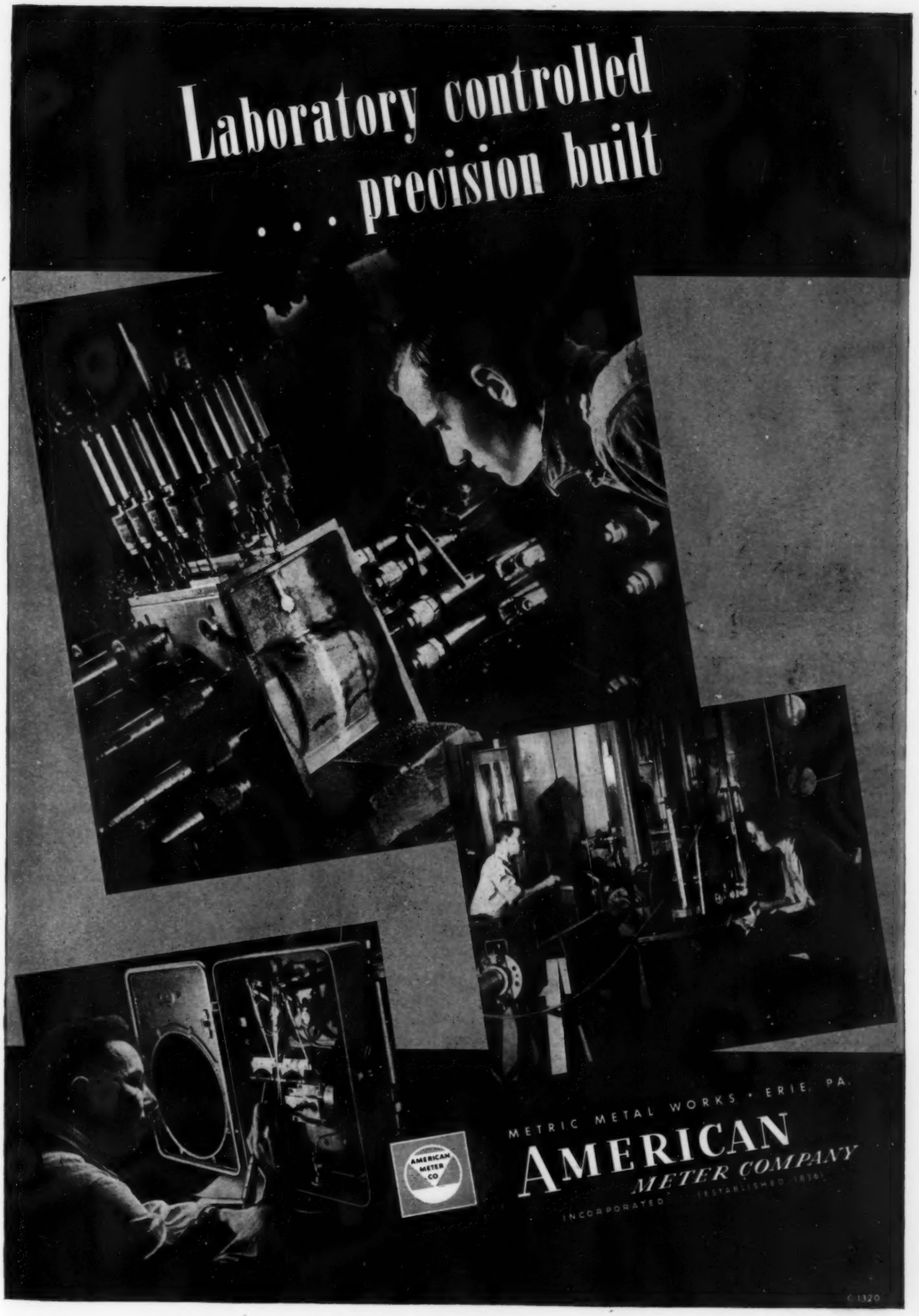
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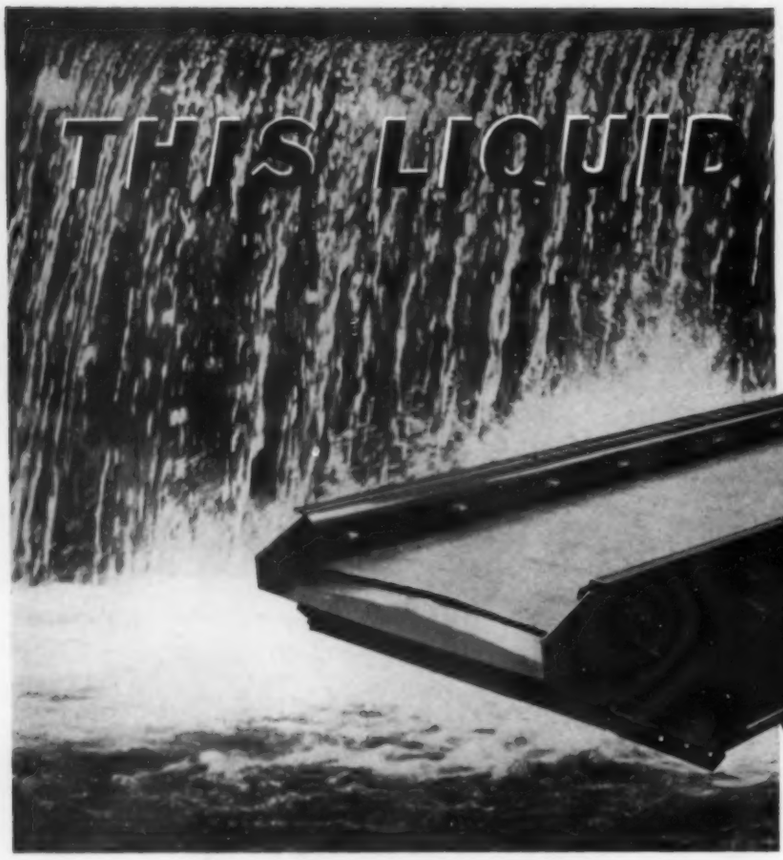

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The rapid vibration of the fine mesh screening surface causes the solids to travel along the screen and allows all of the liquid to pass through it. This screen is lower in first cost and lower in operating cost than any other known equipment capable of performing the same function.

Let us know the nature of your separation requirements and we will gladly advise you as to the recovery percentage and cost of doing the job with a Robins Liquid Screen.

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We handle about ..... gallons per hour of ..... with ..... percent of solids above ..... mesh. Please send us particulars of suitable screen.

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And you'll find all three in SUN PROCESSING OILS! Laboratory tests and performance facts prove SUN Processing Oils' high compatibility with natural and chemically produced rubbers give fine finished compounds of uniform structure . . . greater homogeneity . . . and absence of telltale blooming. Their extraordinary softening power makes SUN Processing Oils unusual plasticizers.

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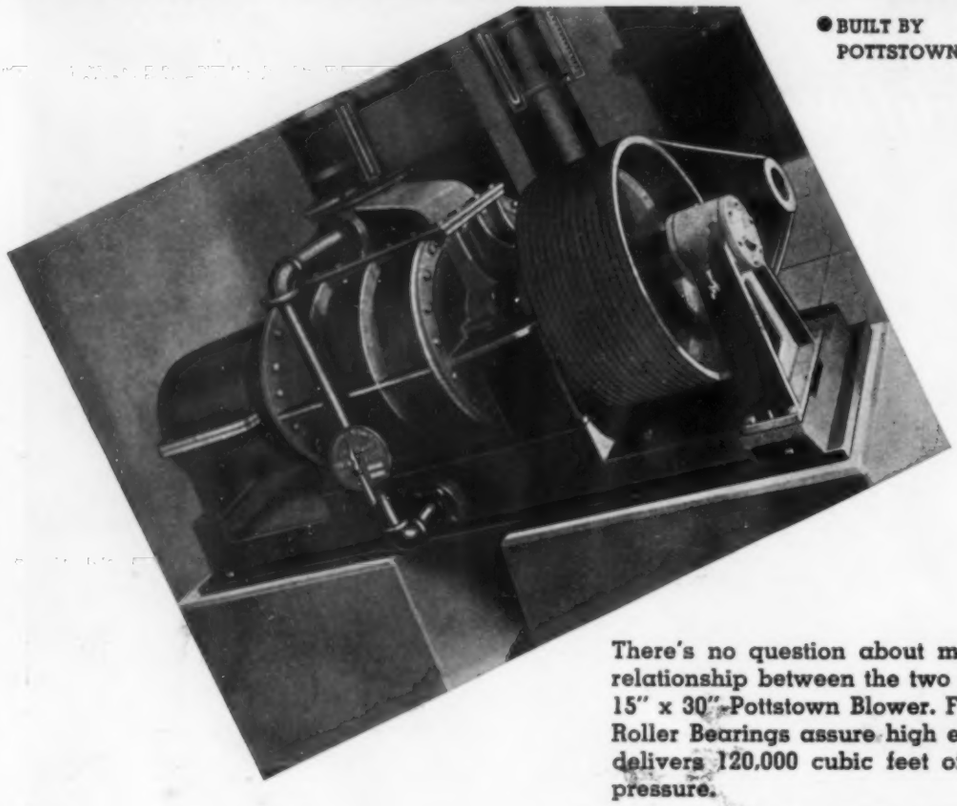
WHATEVER YOUR PROCESS OR INDUSTRY . . . LET SUN ENGINEERS AID YOU!

Photo courtesy of the Firestone Tire & Rubber Co.

USE POTTSTOWN BLOWERS
FOR BETTER RESULTS



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There's no question about maintaining proper clearance relationship between the two rotors and the casing of this 15" x 30" Pottstown Blower. For seven SKF Cylindrical Roller Bearings assure high efficiency while this machine delivers 120,000 cubic feet of gas per hour at 6 pounds pressure.

No matter whether a Pottstown Blower moves gas or air at pressures from ½ to 12 pounds or equivalent vacuum, you can depend upon satisfactory performance. No adjustments are required. Lubrication is needed only infrequently. And wear is definitely checked. The same thing holds true with all types of SKF Bearings. That's why they're preferred in all the fields of Industry. 4450

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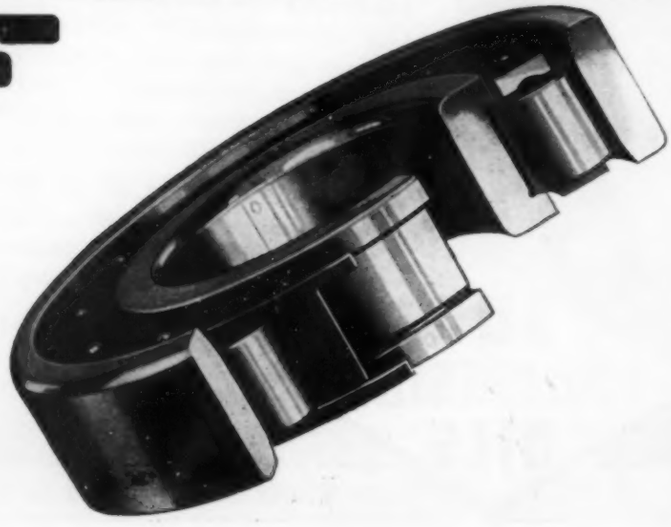

LESS COST, LESS SPACE MORE GALLONS!

Three BIG Reasons Hundreds of Plants are Switching to Allis-Chalmers Extra-Value SSUnit Pumps!

The little pump with the big money-saving performance . . . that's what men in the field say about the sensational SSUnit Pump! And here are the three big reasons they're switching to this low-cost motor-coupled pump . . . originated by the same Allis-Chalmers engineers who designed and built the gigantic turbines at Boulder Dam and Niagara Falls.

LESS COST! Simple design cuts first cost to a new low! Enclosed runner, wearing rings, and shaft sleeves are made of bronze — no chance for rust or excessive wear that runs up maintenance costs! SSUnit Pumps are completely tested before delivery . . . no wasted time or effort . . . they go to work for you the minute they're installed!

LESS SPACE! They set new records for compactness . . . these husky SSUnit Pumps! And they'll operate vertically or practically any way you want them to. That means you can save valuable space in your plant!

MORE GALLONS! You get more gallons with SSUnit Pumps because you get more efficient operation. Actual results in the field prove that new SSUnit Pumps in many cases give more than a 15% greater supply of water than older types of pumps . . . and that more water means more power dollars saved!

But you don't stop there! For coupled to the SSUnit pump is the famous Allis-Chalmers Lo-Maintenance Motor . . . the motor that has proven performance records of beating conditions that many times wreck ordinary motors in a few weeks. There's no "buck-passing" . . . Allis-Chalmers accepts full responsibility for both motor and pump!

PUMPING BRINE IN REFRIGerating system of a large county institution, this SSUnit Pump takes less space, costs less, gives more gallons!

Call the nearest district office today . . . or write direct to Allis-Chalmers. That's the way to get started on real pump savings!

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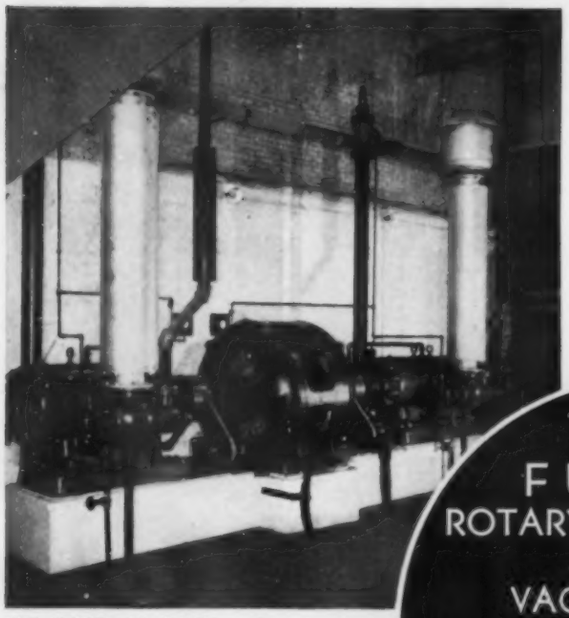

CEMENT PLANT — Single-stage, duplex unit, common motor drive, capacity better than 2200 c.f.m. up to 30 Lb. pressure.

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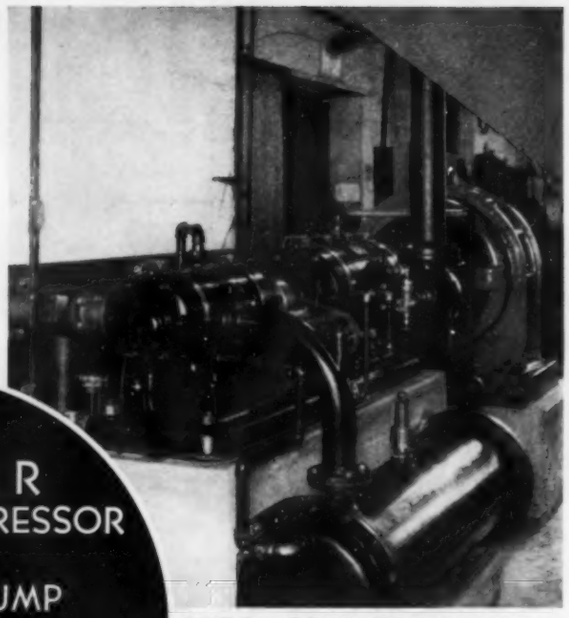
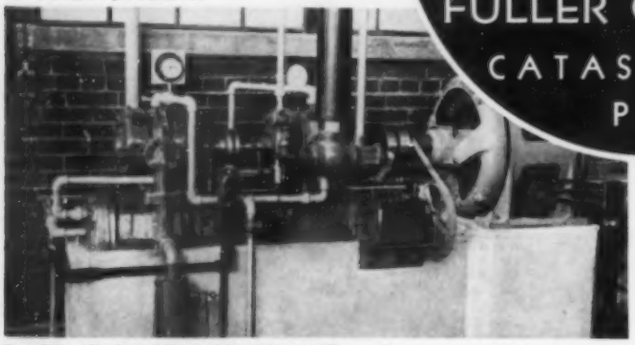
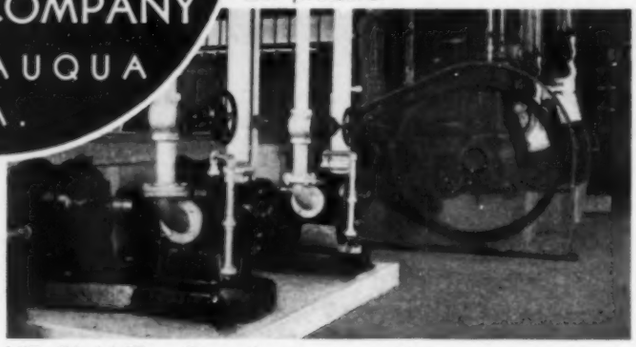


AUTOMOBILE TIRE PLANT — Two-stage Compressor, capacity 388 c.f.m. actual free air delivery, 110 Lb. pressure.

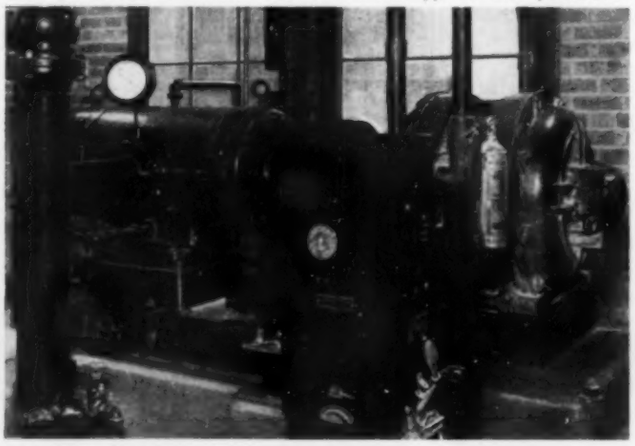


PATENT FASTENER PLANT — Two-stage Compressor, capacity 100 c.f.m. actual free air delivery, 90 Lb. pressure.

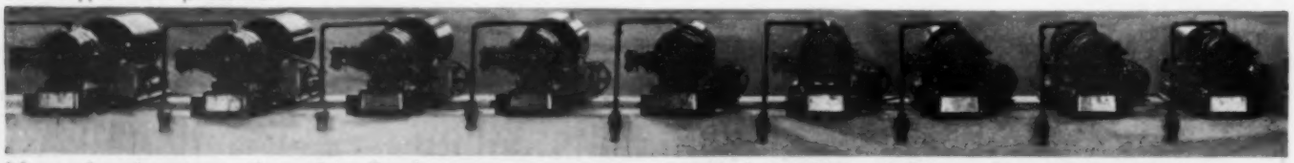


ICE PLANT — Two Single-stage Compressors, capacity each 100 c.f.m. actual free air delivery, 17 Lb. pressure.

GAS & FUEL PLANT — Single-stage, duplex unit, common motor drive, capacity 750 c.f.m. actual free air delivery, 37 Lb. pressure.



GAS & FUEL PLANT — Single-stage Vacuum Pump, capacity 500 c.f.m. at 25 inches of vacuum.



Nine of a shipment of twelve Single-stage compressors installed in United States Post Office Building, Washington, D.C., for use in connection with sewage ejectors. C-38

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SOLVENT NEWS

Reg. U.S. Pat. Off.

December ★ A Monthly Series for Chemists and Executives of the Solvents and Chemical Consuming Industries ★ 1939

Oiticica Oil Use Advances Sharply In Tung Shortage

Processing and Formulation Experience Spurs Consumption

Comparative newcomer in the family of drying oils, oiticica has had a spectacular rise in popularity in the last few years. American imports for the first eight months of 1939 were more than double the entire 1938 consumption, and it is anticipated that final figures for this year may reach 20,000,000 pounds.

Specifications Now Feasible

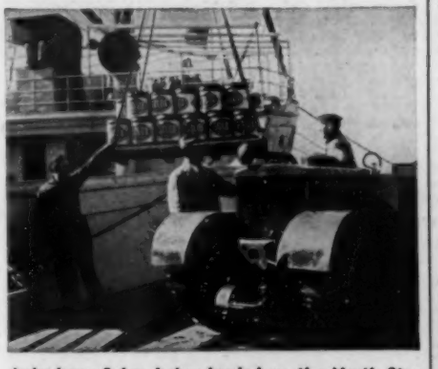
Uncertainty of tung oil supplies has been a big factor in the sharp rise in oiticica consumption since it was introduced to the American paint industry five years ago. Equally important, however, has been the accumulation of experience both in processing the oil and formulating it into paints. In the opinion of an executive of one of the leading oiticica producers, the data now available makes tentative specifications entirely feasible.

A wealth of information on oiticica use has been unearthed in the past few years. At first regarded simply as a substitute for tung, it is now recognized as having definite individual characteristics.

(Continued on next page)

Byrd Antarctic Expedition Will Use Anhydrous Solox

BOSTON, Mass.—U.S.I. Solox will be used to protect the automotive equipment to be used by the Antarctic Byrd Expedition against the dangers which arise from condensed moisture in tanks, supply fuel lines and strainers under the severe temperature conditions which exist in the Antarctic, it was announced here.



Anhydrous Solox being loaded on the North Star for use in fuel tanks of Byrd Expedition.

The freezing of such condensed moisture would present serious consequences, because the clearing of the fuel lines would be practically impossible since metal parts would be too cold to handle safely.

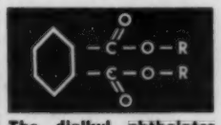
Anhydrous Solox, being soluble in gasoline in all proportions, can be uniformly interspersed throughout the entire mass of the gasoline, and since it is highly hygroscopic, it will be able to absorb the amount of condensed moisture that will probably be encountered. In this way it is possible to hold the moisture finely divided throughout the fuel mass instead of separating out.

Plasticizer Characteristics May Need Further Research Evaluation

Users of Plasticizing Materials Invited by U. S. Industrial Chemicals to Suggest Ideal Properties and Performance in Their Products

Prompted by the widespread interest in plasticizing agents, such as the dialkyl phthalates, U.S.I. plans a broader consideration of plasticizer properties and performance, in order to evaluate present materials and develop, if possible, new ones on a logical basis, as indicated by requirements of users.

Since their first introduction, there has been a consistent demand for all the phthalates as plasticizing agents in surface coatings, adhesives, chlorinated rubber, and plastics. Not only have dibutyl, diamyl, diethyl, and dimethyl phthalates quickly established themselves in a wide variety of industrial applications, but there has been evidence of growing interest in other phthalic acid esters.



The dialkyl phthalates are among the most popular plasticizers.

Users Seeking New Results

This keen interest in the phthalates is particularly noteworthy in view of the large number of other plasticizing agents on the market, including camphor, phosphates, citrates, tartrates, and ricinoleates. It is obvious, however, that many of the users of plasticizers are still searching for material that will give desired results in new processes or products. This is clearly shown by the continuing inquiries, apparently for applications where diamyl, dibutyl, diethyl, and dimethyl phthalates and other available plasticizers do not entirely meet the user's requirements.

It is the belief of U.S.I. that the present use of certain special plasticizers to meet individual requirements fails to answer the basic question. Such special plasticizers are usually adopted because it is felt that the change in the alkyl group will endow the phthalate with certain desirable characteristics. What are these characteristics? Why is it felt that an alkyl chain of more than five carbon atoms is superior to the alkyl groups now being used?

What Is Ideal Plasticizer?

What are the specifications for plasticizer properties and performance? Each user of plasticizers expects the addition of a plasticizer to accomplish certain definite results. What are those desired results? In other

(Continued on next page)

Industrial Alcohol Institute To Dissolve in January

According to a resolution unanimously adopted at a meeting of its Board of Directors, the Industrial Alcohol Institute will be dissolved on or before the 15th of next month. The Institute was organized February 20, 1926, and has cooperated since that date with scientific societies, trade organizations, and others concerned in protecting and promoting the uses of industrial alcohol—ethyl and denatured—under Federal and State laws.

In the resolution the Board praised particularly the services of Miss R. E. Boyce, Executive Secretary, and Captain James P. McGovern, General Counsel. Miss Boyce is finishing her twelfth year with the Institute. Captain McGovern, who has been active in the industry for thirty-nine years and General Counsel of the Institute since its organization, will continue the general practice of law in the Munsey Building, Washington, D. C.

A recent article by Dr. Harry L. Fisher, of the U. S. Industrial Alcohol Co., treats in detail the vulcanization of rubber, discussing the chemistry of the process and listing a number of non-sulphur vulcanizing agents, including some not previously described. Reprints of the article may be obtained free of charge from U.S.I. Ask for Bulletin VR.

Makes New Starch Paste For Paints and Lacquers

CHICAGO, Ill.—A new starch paste that is said to be suitable for use as a filler or thickener in paints, lacquers, and polishing compositions has been patented by an inventor here. The paste is reported to be water-free and water-resisting.

Lacquers, plastics, and paper coatings are a few of the industries making extensive use of plasticizers. Many of these users are searching for plasticizers with properties to meet the requirements of new products or processes.

ADVERTISEMENT—*This entire page is a paid advertisement.*

December ★ **SOLVENT NEWS** ★ 1939

"Dry-Ice" Keeps Glacial Ice Frozen in Shipment

LONGMIRE, Mt. Rainier National Park—Keeping 350 pounds of glacial ice frozen on a trip halfway across the country is something of a trick, and scientists here accomplished it by packing the ice in solid carbon dioxide ("Dry-Ice"*). Purpose of the unusual shipment is to study size of ice crystals at different depths in the glacier.

NEW YORK, N. Y.—Another novel use of "Dry-Ice"* is suggested in a patent granted to an inventor here, who claims that solid blocks of "Dry-Ice"* will extinguish gasoline, oil, or naphtha fires more efficiently than carbon dioxide gas or "snow."

*Manufactured and supplied by Pure Carbonic, Incorporated, an associated Company of U.S.I.

Improves Tire Fabrics With Dimethyl Phthalate

NEW YORK, N. Y.—A new fabric for tires and other rubber articles holds its weave shape exceptionally well, yet when subjected to vulcanizing temperatures the weft threads become inoperative, allowing the warp cords to lie straight, it is set forth in a patent issued to an inventor here. Weft of the fabric consists of organic esters or ethers of cellulose, containing from 5 to 30% of dimethyl phthalate or other solvents which display solvent action for the cellulose derivatives used at elevated temperatures, but not at normal temperatures.

Dimethyl phthalate is a product of U.S.I.

Plasticizer Characteristics

(*Continued from previous page*)

words, what is the user's conception of an ideal plasticizer? The answer to this question will, of course, be different depending on the use of plasticizers for different purposes. The manufacturers of plastics, adhesives, films, and protective coatings expect a plasticizer to perform certain duties. Are these duties best fulfilled by a mono-, di-, or tri-basic acid ester plasticizer? Is the variation of the alkyl group the answer?

U.S.I. believes that a fuller understanding of the answers to these questions is a necessary prerequisite to a logical study.

In order to accomplish this result, SOLVENT NEWS asks its readers to outline their requirements for plasticizing materials. What are the physical characteristics which are most desirable? What effect is expected by the addition of the plasticizer?

U.S.I. will welcome your comments and suggestions.

Thermometer Is Sealed Against Varnish Fumes

ROCHESTER, N. Y.—Fogging of glass and scales is avoided by any thermometer sealed against fumes and vapors, it is announced by a manufacturer here. Such a thermometer is useful in gum melting, oil boiling, and varnish cooking, the announcement continues, and eliminates the need for frequent cleaning of the tube and scale. It is also said that the thermometer uses a triple-lens tube with twice the accustomed angle of vision, and focuses three times as much light on the contrasting background.

Employs Ethyl Alcohol To Color Bronze Powders

NEW YORK, N. Y.—Bronze powders can be colored in a wide variety of lightfast shades by a new process involving an organic solvent such as ethyl alcohol, according to a patent issued to an inventor here.

The process consists in mixing aluminum bronze powders with tannic acid, alcohol, and a dye such as Brilliant Green or Auramine.

Ethyl Alcohol is produced by U.S.I.

Oiticica Consumption Rises

(*Continued from previous page*)

It is reported, for example, that products formulated with oiticica show slightly less resistance to water and alkalis than tung products, although the difference is less noticeable in pigmented products than in clear varnishes. Oiticica paints, on the other hand, show greater resistance to gases and less tendency to skin.

Inorganic Driers Unsuitable

Other studies have shown that inorganic salts should not be used as driers with oiticica, as they may cause violent foaming at high temperatures. Naphthenic driers or liquid linoleates are said to be suitable. Oiticica may require more driers than tung.

Experience seems to indicate that oiticica is best suited for the formulation of long oil varnishes with the best grade of synthetic resins. With 100% synthetic resins the bodying time of oiticica is less than with tung.

TECHNICAL DEVELOPMENTS

Further information on these items may be obtained by writing to U.S.I.

An industrial odorant is said to overcome the objectionable odors of interior paint jobs. When added to paint, varnishes, and enamel mixes, it completely neutralizes the paint odors, and has no distinctive odor of its own, it is claimed. **(No. 280)**

U S I

A thermostatic filler automatically corrects liquid volume for changes in temperature, it is reported. It is said to facilitate uniform filling of containers under varying temperature conditions. **(No. 281)**

U S I

A new adhesive is said to be suitable for bonding plywood in the hot-press method, and for bonding thin veneers to wood, composition board, and some sheet metals. Adhesive is of the phenolic resin type, and is not affected by water or exposure to weather, the maker states. **(No. 282)**

U S I

A new faucet speeds up the handling of oils, paints, glues, and other viscous liquids, it is reported. It is said that shut-off is practically instantaneous and dripless. **(No. 283)**

U S I

Oil viscosity can be determined by new equipment, which permits making tests in accordance with ASTM Method D-88, it is claimed. Equipment is said to have a temperature range from 70 to 212 degrees F. **(No. 284)**

U S I

An aluminum paint can be applied to rusted chain link fence without removing the rust, the manufacturer claims. It is reported that the paint retains sufficient elasticity to prevent chipping when fence joints move. **(No. 285)**

U S I

A hammered finish can be applied on rough or porous metals, it is reported. Applications suggested by the maker include boiler jackets, water heaters, office equipment, and furniture. It is said to cover defects such as weld marks or file scratches. **(No. 286)**

U S I

An all-purpose cleaner is said to be free from abrasives, animal fats, and inert fillers. It is claimed that repeated applications of the cleaner will not injure any fabric or surface not affected by plain water. **(No. 287)**

U S I

A silver-like coating is said to resist vapors and fumes of strong corrosive agents. It is also said to be resistant to heat and proof against oil and water. Material is said to be a chromium treated aluminum paste. **(No. 288)**

U S I

A porcelain-like finish can be obtained with a paint that sets in about 15 minutes and dries hard in about an hour, it is claimed. Finish is said to be highly resistant to heat, water, acids, alkalis, and alcohol. **(No. 289)**

U.S.I. INDUSTRIAL CHEMICALS, INC.

60 EAST 42ND ST., N.Y. (U.S.I.) BRANCHES IN ALL PRINCIPAL CITIES

A SUBSIDIARY OF U. S. INDUSTRIAL ALCOHOL CO.

ALCOHOLS
Amyl Alcohol
Butyl Alcohol
Fusel Oil—Refined
Methanol

Ethyl Alcohol
Anhydrous
Absolute
C. P. 96%
Pure (190 proof)
Specially Denatured
Completely Denatured
U. S. I. (Denatured Alcohol Anti-freeze)
Super Pyro Anti-freeze
Solox Proprietary Solvent

ANSOLS
Ansol M
Ansol PR

ESTERS, ACETATES
Acetic Ether
Amyl Acetate
Butyl Acetate
Ethyl Acetate

ESTERS, ETHYL
Diatol
Diethyl Carbonate
Diethyl Oxalate
Ethyl Chlorocarbonate
Ethyl Formate
Ethyl Lactate

Registered Trade Mark

ESTERS, PHTHALATES
Diamyl Phthalate
Dibutyl Phthalate
Diethyl Phthalate
Dimethyl Phthalate

OTHER ESTERS
Amyl Propionate
Butyl Propionate
Dibutyl Oxalate

INTERMEDIATES
Acetoacetanilid
Acetoacet-o-chloranilid
Acetoacet-o-toluidid
Ethyl Acetoacetate
Sodium Ethyl Oxalacetate

ETHERS
Ethyl Ether
Ethyl Ether Absolute—A.C.S.

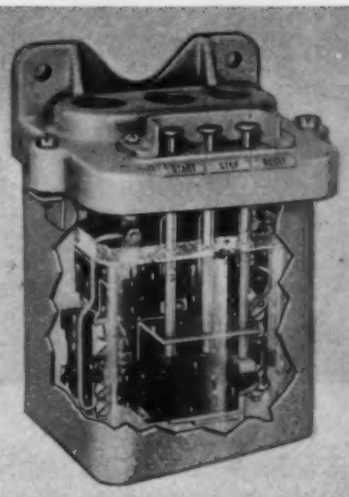
OTHER PRODUCTS
Acetone, C.P.
Butyl-mesityl-oxide-oxalate
Cellulose Acetate
Collodions
Curbay Binders
Curbay X (Dried Curbay)
Derex
Ethylene
Methyl Acetone
Nitrocellulose Solutions
Potash, Agricultural
Vacatone

"Just because it's so roomy, now you won't live with us any more!"

There's plenty of room in Allen-Bradley solenoid starters. The generous wiring space eliminates cramped wiring and skinned knuckles. The white interiors, removable cabinet covers, and easy-to-get-at terminals also make wiring easy.

In chemical and process plants motor starters are frequently used with special enclosures that have bolted covers or are immersed in oil. Hence, inspection or maintenance is difficult and messy. With Allen-Bradley solenoid starters, maintenance is practically eliminated. Their double break, cadmium silver alloy contacts never require cleaning or filing. They have no bearings, pins, or pivots to stick, and no flexible shunts to break. Maintenance men can install these starters and safely forget them.

It's no wonder that Allen-Bradley solenoid starters are so popular in the chemical industry for the control of process equipment. You, too, can profit by their time- and trouble-saving features.



Cut-away view of Allen-Bradley Bulletin 709 oil-immersed starter (Type J) for installation in corrosive atmospheres.

These Starters *can't* Corrode

To insure unfailing switch action in the presence of corrosive gases, these starters have oil-immersed mechanisms. Type J, shown above, meets all requirements for a corrosion-proof starter. NEMA Type 8, shown below, has the oil-immersed feature and also meets Underwriters' requirements for Class 1, Group D, hazardous gas locations.

Entire Switch Is Immersed in Oil

The entire switch mechanism and contacts are immersed in a removable oil tank, thus giving protection against corrosion.

Bulletin 709 Solenoid Starter (NEMA Type 8) for corrosive and explosive atmospheres.

Get Your Copy of this Book!

Allen-Bradley Company
1337 S. First Street,
Milwaukee, Wisconsin
Please send me
"The Story of the Solenoid Starter."

Name.....

Company.....

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City..... State.....

Allen-Bradley Company

A·B

1337 S. First St.
Milwaukee

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL

Everybody knows C-E

but . . .

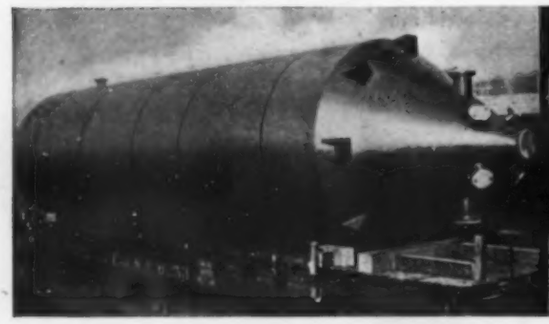
Everybody knows C-E . . . that is, everybody concerned with steam power generation seems to be aware that Combustion Engineering is leading the field when it comes to building boiler-plant "Big Berthas." A quick check on recent boiler installations in the high-capacity, high-pressure category tells the story.

But—what everybody *doesn't* know, or at least hasn't fully realized, is that these same C-E manufacturing facilities are ideally suited to the manufacture of all types of high-grade pressure vessels used in the process industries. That these boiler building facilities, probably the finest in the world, are equally applicable to the production of virtually all types of pressure vessels is reflected in the fact that C-E shops have turned out hundreds of vessels of various kinds, a few of which are here illustrated.

Look over these examples of pressure vessels fabricated to specifications by COMBUSTION ENGINEERING. And next time, when a job to meet some similar requirement of your own is up for action, why not make sure that somebody gets a quotation from C-E.

Write for this booklet "Pressure Vessels and Fabricated Plate Work" contains more illustrations of the wide variety of fabricated work done in C-E shops. It also pictures plate-forming equipment, X-ray testing units and other modern facilities for turning out work of this kind. See for yourself why C-E can assure sound welds and meet exacting specifications.

PULP DIGESTER



This cylindrical pulp digester is one of five fabricated for a paper company. It is 11 ft. 3 in. I.D., 49 ft. 6 in. long and 1 11/32 in. plate thickness.

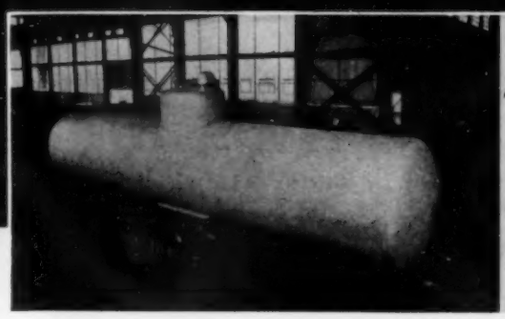
NOZZLE SECTION

Completely welded nozzle section for heat exchanger.

AUTOCLAVES

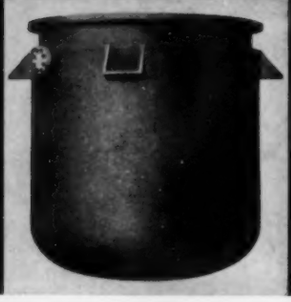
Autoclaves for chemical processing; 3 ft. 11¾ in. I.D., 11 ft. 6 in. long and 1⅛ in., plate thickness; design pressure 175 lb. per sq. in.

TANK-CAR TANK



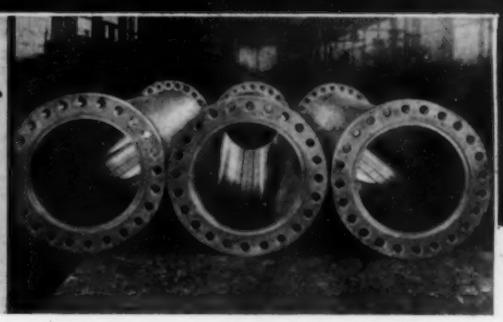
Stainless-steel tank-car of completely welded construction. Capacity 8000 gal. Built to transport a chemical product without contamination.

KETTLE



Jacketed vessel for chemical process. It is approximately 6 ft. I.D. and 7 ft. deep.

HYDRAULIC CYLINDERS



Part of an order for 12 hydraulic cylinders. Built of 1½ in. thick plate rolled and welded; machined inside and out.

A FEW OF THE MANY VESSELS FABRICATED BY C-E

Accumulators	Converters	Dryers	Retorts
Autoclaves	Crystallizers	Evaporators	Scrubbers
Chlorinators	Cylinders	Extractors	Separators
Columns	Diffusers	Flash Chambers	Stills
Coolers	Digesters	Kettles	Tanks
Condensers	Dissolvers	Pots	Towers

COMBUSTION ENGINEERING COMPANY, Inc., 200 Madison Ave., New York, N. Y.

C-E Products include all types of Boilers, Furnaces, Pulverized Fuel Systems and Stokers, also Superheaters, Economizers and Air Heaters

BIGGEST AND HEAVIEST BUILT TO DATE

A-466

This huge bubble tower, 13 ft. 2 in. diameter, 92 ft. long and 2½ in. plate thickness, weighs 490,000 pounds. It is believed to be the largest and heaviest vessel ever shipped by rail.

PLATINUM

Enlarges Its Field in Industry

The myriad uses of platinum in industry, in important parts of the actual tools of production, is an outstanding feature of our times. Chemical and industrial engineers have long wished to take advantage of platinum's resistance to the action of corrosive agents, in wider applications, to prevent contamination and secure greater uniformity and a higher degree of purity in the product, but have been prevented by the factors of excessive cost and weight.

PLATINUM CLAD

Now, a new material, Platinum Clad, has been perfected by us which makes it economical to employ platinum in vessels and other apparatus of large size—economical because of the much longer life of the units and the fact that the platinum never loses its intrinsic value. Platinum Clad is base metal to one or both sides of which has been welded pure platinum of any required thickness, the surface being a continuous, unbroken sheet of the precious metal. It is available in sheets, ready for forming, in wire and in tubing with platinum upon either or both surfaces.

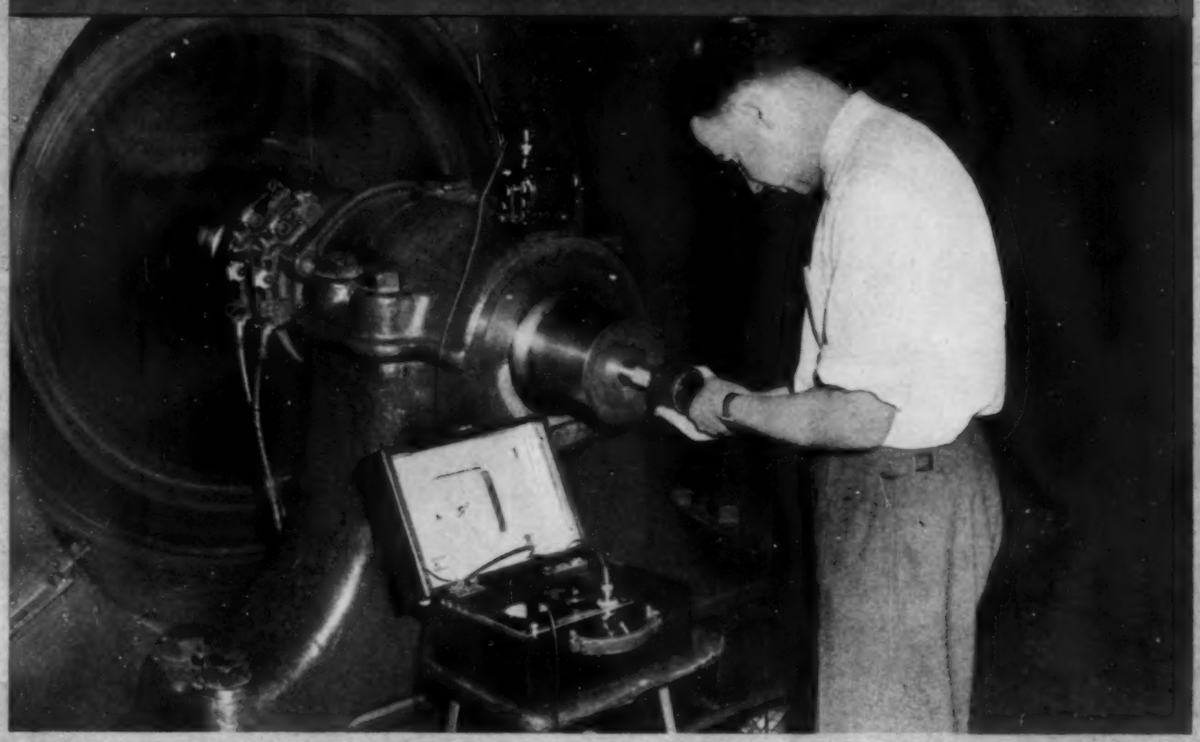
We have a booklet describing this product. Every technical man should read it and it's yours upon request.

BAKER & CO., INC.

SMELTERS, REFINERS AND WORKERS OF PLATINUM, GOLD AND SILVER

113 Astor Street, Newark, N. J.

To Measure—BALANCE ELECTRICALLY



HOW simple would you say it is to balance a 50-ton alternator rotor moving at 3600 rpm until its vibration is less than three ten-thousandths of an inch—or one-tenth the diameter of a human hair? Not very, you say? Well, a little while ago you may have been right. Today you're wrong.

For while heretofore the balancing of large rotating machines was a long, drawn-out procedure, perhaps requiring the removal of the rotors from the machines, now there is a portable G-E instrument that does the job simply, quickly, and under actual operating conditions. And on a 20,000-kva synchronous condenser, for example, balance can be achieved with as few as three runs—which is a far cry from the 100 to 170 trials which were frequently necessary before.

In simple terms, the balancer consists of a hand-held sine-wave alternator, a vibration pick-up, and an instrument. These provide the essential measurements, which are made both before and after trial weights have been placed in chosen balancing planes. By interpretation of the facts thus obtained, almost perfect balance of the machine can be achieved.

Here, then, is another portable, precise, electric instrument for the measurement of a nonelectrical quantity. It joins the ranks of G-E instruments developed to measure the surge of lightning, the trickle of electrons in a vacuum—instruments to analyze color exactly and to unscramble and measure sound waves.

The contributions of G-E engineers to its development were made possible by years of research and a half-century of experience in every field of electrical endeavor. And yet they represent no more dramatic achievement, really, than that of providing accuracy and dependability in the complete line of G-E instruments for the measurement of electrical quantities —current, voltage, resistance, watts, frequency, power-factor—in dozens of styles, indicating and recording, and in ratings to fill every need. That's why, if your problem involves measurement, you should remember General Electric, Schenectady, New York.

HEADQUARTERS FOR ELECTRICAL MEASUREMENT

GENERAL ELECTRIC

430-160

CONTROL COLD WITH CORK

CHOOSE ARMSTRONG'S CORK COVERING FOR EFFICIENT COLD LINE INSULATION

KEEP COLD INSIDE

That's a job for cork insulation, and that's why the connecting lines on this oil refinery filter are insulated with special brine thickness Armstrong's Cork Covering. This insulation provides the same lasting and efficient insulation protection for both fittings and straight runs.

TIME and again, CORK insulation has proved its value to industries using low temperature processes. That's why so many of the country's leading plants use Armstrong's Cork Covering to insulate cold lines.

Armstrong's Cork Covering offers practical, efficient insulation under the most severe service conditions. It presents a highly effective barrier to the passage of heat and resists moisture, the enemy of insulating efficiency. This material gives lasting protection that saves refrigeration and helps to control processing temperatures within narrow ranges.

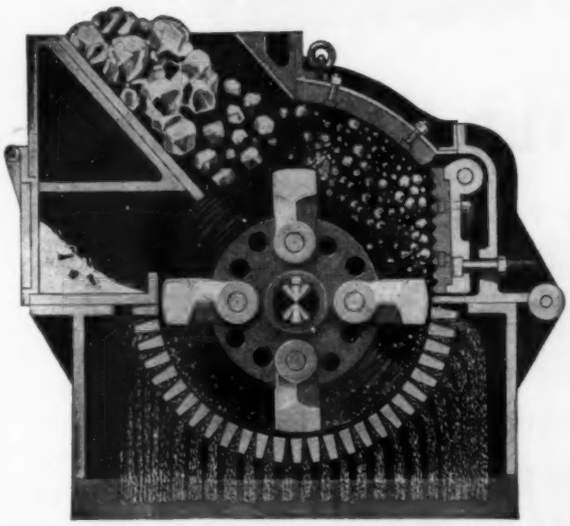
Armstrong's Cork Covering is strong and rigid. It comes in a wide variety of sizes and forms that fit accurately on pipes and fittings. This insulation is quickly and easily installed. Three standard thicknesses meet most service requirements.

Call on Armstrong's Contract Department whenever you plan low-temperature installations. Experienced engineers and skilled workmen can assure proper erection for the greatest insulating efficiency and economy. Write for complete information and samples of Armstrong's Cork Covering. Armstrong Cork Co., Building Materials Div., 919 Concord Street, Lancaster, Pa.

Armstrong's CORK INSULATION

CORKBOARD *for Cold Rooms and Equipment* . . . **CORK COVERING** *for Cold Lines*

HEAVY DUTY HAMMER CRUSHERS for COARSE GRINDING...



CRUSHERS, PULVERIZERS and SHREDDERS . . . for

• DEPENDABLE WORK •

A SIZE AND TYPE FOR EVERY JOB

Small machines with capacities of 200 pounds per hour for crushing coal, clay, brickbats, glass, etc.

Largest machines handle steam shovel size stone, reducing 4' cube rock to 1¼" in one operation at the rate of 300 tons per hour.

Intermediate sizes crush oil cake, oyster shells, bone, salt cake, garbage, tankage, etc.

Shredders for preparing chips and bark previous to extraction processes.

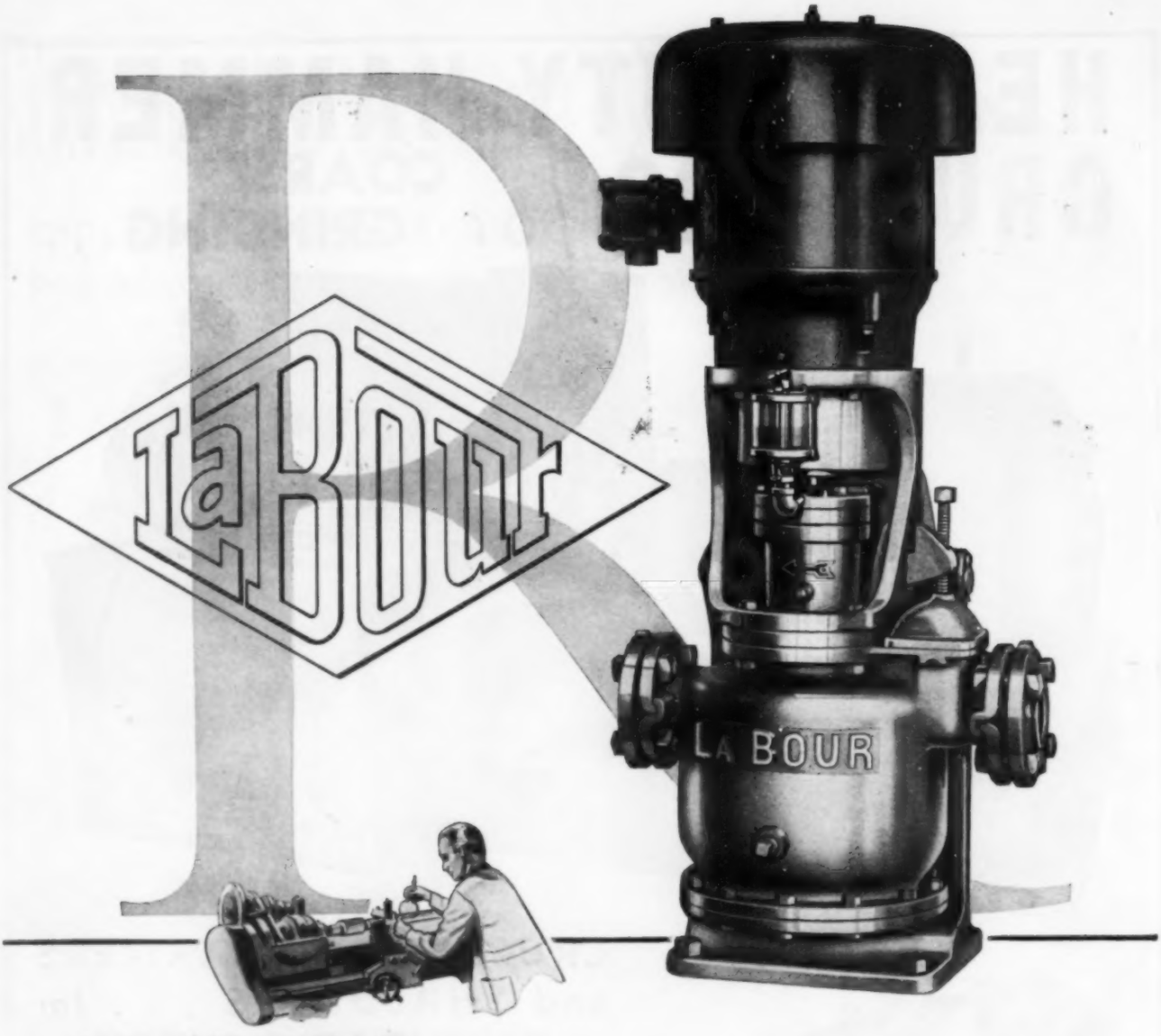
. . . Write for descriptive bulletins today . . .

THE WILLIAMS PATENT CRUSHER & PULVERIZER CO.
2706 North Ninth St. St. Louis, Mo.
SALES AGENCIES IN ALL PRINCIPAL CITIES INCLUDING
Chicago—37 W. Van Buren New York—15 Park Row Oakland, Calif—1629 Telegraph

CRUSHERS
GRINDERS
SHREDDERS

WILLIAMS
OLDEST AND LARGEST BUILDERS OF HAMMERMILLS IN THE WORLD
PATENT CRUSHERS GRINDERS SHREDDERS

AIR SEPARATORS
ROLLER MILLS
VIBRATING
SCREENS



30 YEARS TO BUILD THIS PUMP

Although the LaBour Type R Pump is radically new, accomplishing performance standards heretofore thought impossible, it is based on principles which have been thoroughly tested and proved. Actually, the Type R represents the result of more than 30 years spent by its designer in working with the problems of the field in general and of self-priming centrifugal pumps in particular.

Higher efficiencies and the complete absence of any packing gland are only two of the features of the LaBour Type R Pump. Send for Bulletin 48 for further details.

THE LABOUR COMPANY, INC., ELKHART, INDIANA, U.S.A.

LOUISVILLE DRYER CUTS COSTS FROM $35,700 TO $9,450!

Perhaps in no other field of industry is there an operation which *penalizes inefficiency* so much as does the drying process. All over America today there are thousands of plants which could probably *double* their present profit showings, simply by effecting an entirely practicable improvement in their drying operations alone.

The case detailed at the right is a typical example. The manufacturer was drying and selling a scrap by-product—and virtually swapping dollars on the transaction. By permitting us to analyze his procedure, and then acting on our *guaranteed recommendation*, this one customer has boosted his manufacturing profit from 10.7% to 76.3% of his total sales!

FORMER DRYER
(Steam-jacketed batch type)

Annual output, tons	2,100
Value, at $19 per ton	$39,900
All drying costs	$35,700
Net annual return	$4,200

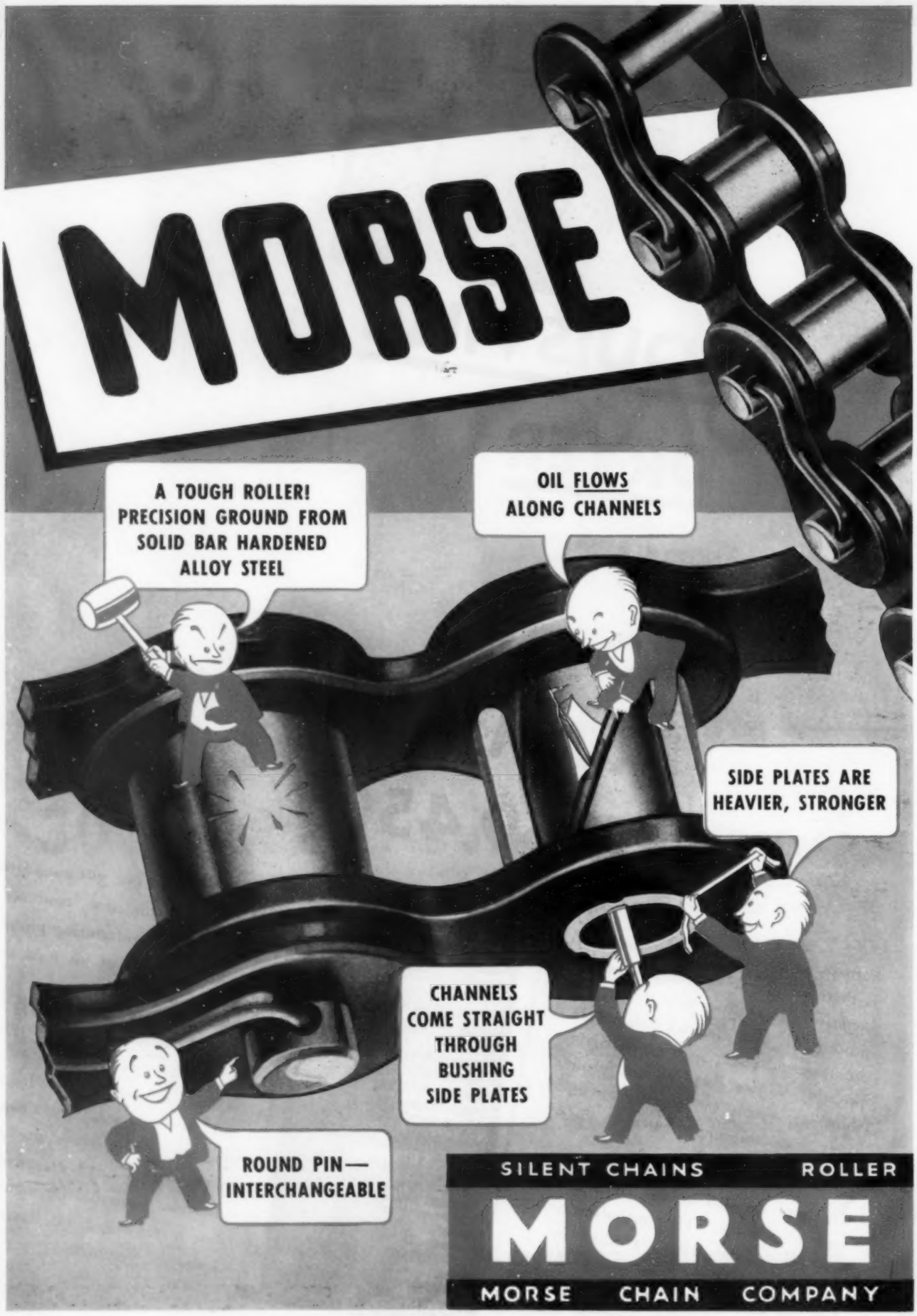
LOUISVILLE DRYER
(Rotary, Continuous Type)

Annual output, tons	2,100
Value, at $19 per ton	$39,900
All drying costs	$ 9,450
Net annual return	$30,450

SUMMARY

Net annual return, Louisville Dryer	$30,450
Net annual return, "Competitive" dryer	$ 4,200
Annual net increase in profit	$26,250
Installed cost, Louisville Dryer	$25,000
ANNUAL RETURN ON INVESTMENT	105%

Unless you have had your drying process analyzed by Louisville, there is still a large possibility of similar savings in *your* plant. Why not find out? Write us today for a brief list of questions which, when answered, will permit us to make recommendations. *Address:* Louisville Drying Machinery Co., *Incorporated*, 451 Baxter Avenue, Louisville, Kentucky.


MORSE
A TOUGH ROLLER! PRECISION GROUND FROM SOLID BAR HARDENED ALLOY STEEL
OIL FLOWS ALONG CHANNELS
SIDE PLATES ARE HEAVIER, STRONGER
CHANNELS COME STRAIGHT THROUGH BUSHING SIDE PLATES
ROUND PIN— INTERCHANGEABLE
SILENT CHAINS ROLLER
MORSE
MORSE CHAIN COMPANY

Roller Chain

. . . interchangeable, channel lubricated . . . GREATEST ROLLER CHAIN ADVANCE IN A DECADE

NOW . . . Morse Roller Chain. A chain with a built-in lubrication system in every link, and which is completely interchangeable with every other standard roller chain. It's just what the engineers ordered.

The Morse Roller Chain puts the protection of assured lubrication right where it is most needed—and where conventionally designed roller chains most often fail—on the bearing surface of pins and bushings. Oil on the rollers of the Morse Roller Chain quickly finds its way to the spaced channels on the bushing face, flows through the side plates and down to the pin, where capillary action takes charge and spreads a protective film over the whole pin surface.

Positive lubrication makes for longer life. Here are other features which mean economical, trouble-free operation: huskier side plates mean tighter pins and bushings, making Morse Roller Chains comparable in strength to "heavy series" in other types; rollers are ground from solid bar hardened alloy steel; Morse patented spring cotter, available at no extra cost, is fast against all vibration and will not chew.

Let the Morse man in your territory tell you all about Morse Roller Chains —or write direct to Morse, Ithaca.

Interchangeable with all Standard Roller Chains

THE PIN LINK

OFFSET LINK for chains with uneven number of links

THE BUSHING LINK

CHAINS FLEXIBLE COUPLINGS KELPO CLUTCHES

Roller CHAINS

ITHACA N. Y. DIVISION OF BORG-WARNER CORP.

NO STUFFING BOX
in This Acid Pump!

Trouble FREE!

Saves Costs!

Runs Continuously Without Attention!

Here's a pump that reaches a new level of HIGH EFFICIENCY in the handling of corrosive acids, corrosives, hot liquids, alkali, abrasive solutions and other hard-to-handle liquids. It has no stuffing box—therefore is free from stuffing box trouble and stuffing box contamination.

Gives continuous 24-hour performance without attention. Effective sealing blades solve leakage problems. No rubbing contact between rotating and stationary parts. 10- to 1,000-G.P.M. capacities and 15- to 250-ft. heads. Complete engineering service. Write for complete details if you want to be rid of your acid-pumping worries.

A. R. WILFLEY & SONS, INC., Denver, Colorado, U. S. A.
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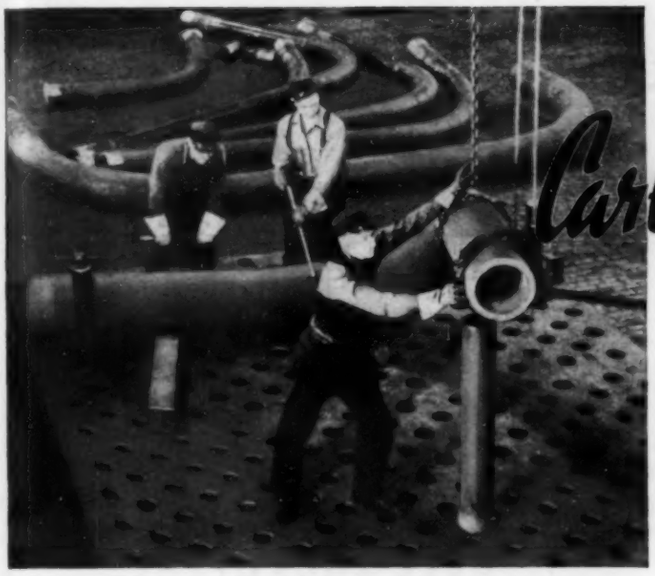
WILFLEY

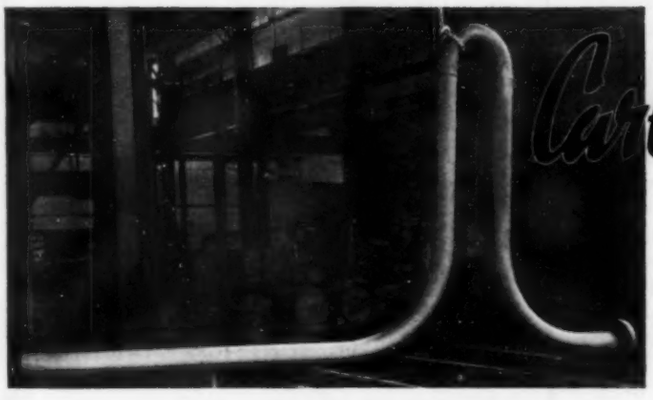
DIRECT DRIVE • BELT DRIVE • UNITARY • ACID PUMPS

PITTSBURGH PIPING CAN MEET
Your Piping Requirements to the Letter



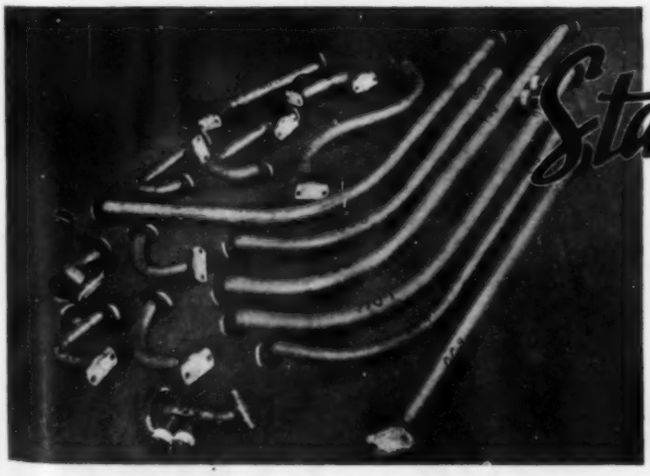
Carbon Moly Steel Piping

Since the increase in steam pressures and temperatures made the use of low alloy steels necessary, Pittsburgh Piping has fabricated and erected this type of piping for many of the country's foremost power systems. Because Carbon Molybdenum and other low alloy steels require extra care in fabrication, Pittsburgh Piping has developed a special technique for the highly efficient working of this type of material. This special technique extends to all operations in field erection as well.



Carbon Steel Piping

In its five acre plant, Pittsburgh Piping has complete facilities for pre-fabricating large sub-assemblies for every conceivable power and process requirement. Modern erection equipment and field welding methods used by specially trained crews assure speedy and efficient erection without interfering with other sub-contractors on the job.



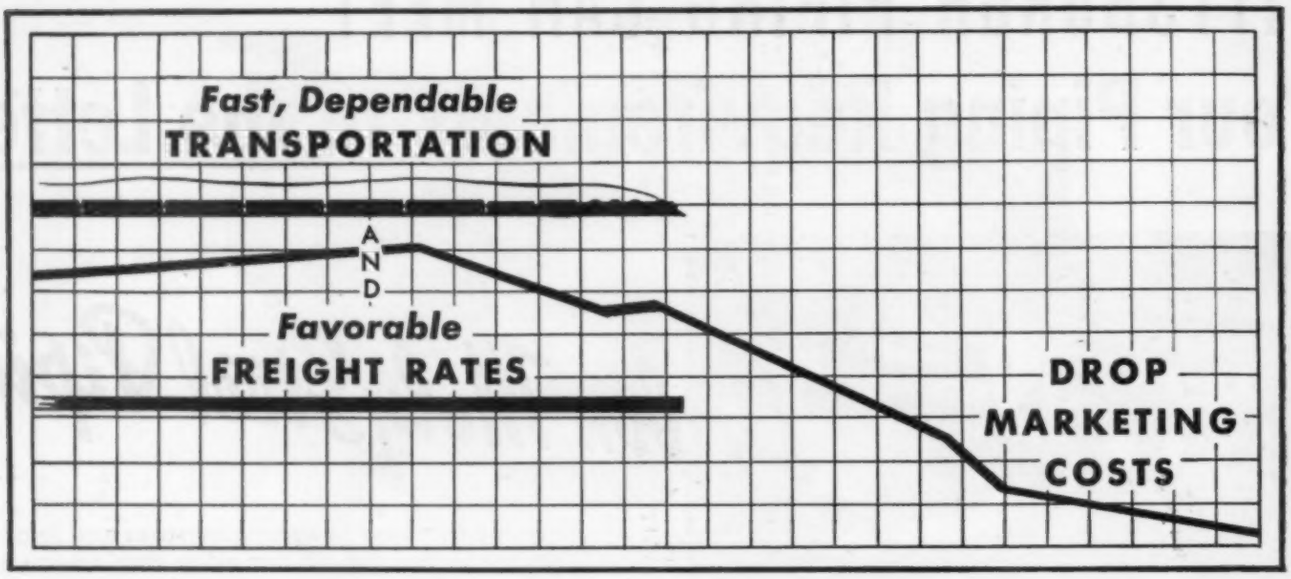
Stainless Steel Piping

Since 1933, the Alloy Division of Pittsburgh Piping has been fabricating stainless piping and vessels for process industries. Because of the many metallurgical characteristics peculiar to stainless steel alone, Pittsburgh Piping has experienced fabricators that work only on stainless. The relative high cost of raw materials makes it more imperative than ever to have this type of fabrication done by stainless specialists at Pittsburgh Piping.

PITTSBURGH PIPING & EQUIPMENT CO., 10 FORTY-THIRD ST., PITTSBURGH, PA.

Woolworth Bldg. New York | Occidental Bldg. Indianapolis | Peoples Gas Bldg. Chicago | General Motors Bldg. Detroit | Public Sq. Bldg. Cleveland | 10 High St. Boston | 1st. Nat'l. Bank Bldg. Charlotte | 525 Market St. San Francisco

Pittsburgh Piping



...and Industry enjoys

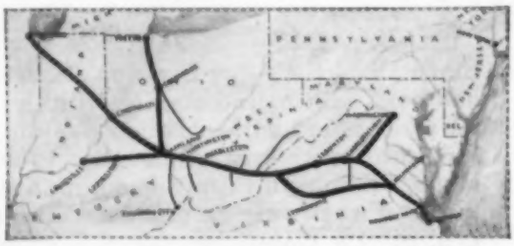
EXCELLENT TRANSPORTATION FACILITIES

in Chesapeake and Ohio Territory

Speed, favorable freight rates and dependable service are essential factors in the economics of marketing. Chesapeake and Ohio Lines—"The Road that Service Built"—has an enviable reputation among shippers in its territory: Virginia, West Virginia, Kentucky, Ohio and Indiana.

Running east and west through the heart of these states, Chesapeake and Ohio rails bring key cities of the east, midwest and south within first to third morning delivery of almost any point in the territory. Numerous strategic connections with other major railroads facilitate rapid delivery to any point in the United States. Heavy traffic and scheduled merchandise freight of every sort make demands on Chesapeake and Ohio service—demands which are scrupulously met by intelligent personnel operating a railroad plant and equipment second to none.

A great variety of industries have found that location in Chesapeake and Ohio Territory has lowered their production costs; for, besides excellent transportation, this region provides available industrial sites, easy access to raw materials, abundant native-born labor, cheap power and the benefits of business-minded legislation.



THESE ADVANTAGES

are but the fundamentals of many favorable conditions making Chesapeake and Ohio Territory an economic field of operation for many industries.

- RAW MATERIALS of many kinds; abundant, near at hand, economically secured.
- INTELLIGENT LABOR—native-born; largely skilled in a diversity of industries; well housed; peaceful and cooperative.
- NEAR TO MARKETS—major consuming areas within first, second or third morning delivery.
- EXCELLENT TRANSPORTATION—favorable freight rates and dependable service keep markets and manufacturers in economically close touch.
- CHEAP POWER—abundant coal, oil, natural gas and hydro-electric developments assure this region of unlimited power at most economical costs.
- COOPERATIVE LEGISLATION—Industry is king in Chesapeake and Ohio Territory, and the legislatures of the five great States in which it lies are friendly toward the needs and aims of enterprises they invite and those they already have.

What do you seek in a more advantageous location? Complete and impartial factual surveys for your specific industry will be furnished on request. All inquiries will be held in strictest confidence. Write

GEORGE D. MOFFETT, *Industrial Commissioner*
CHESAPEAKE AND OHIO LINES, Huntington, W. Va.

CHESAPEAKE *and Ohio* LINES

YOU KNOW BECAUSE YOU SEE

THEY CALLED HIM THE MAN WITH X-RAY EYES

He won his title because when piping troubles occurred, he could nearly always put his finger on the source. His ability seemed uncanny but it was only blindfold guessing . . .

Now, since "Pyrex" Piping has been installed, you can see *exactly* what is occurring inside the "Pyrex" Piping. Definite knowledge has replaced blindfold uncertainty.

And not only is "Pyrex" Piping transparent, but it also has remarkable resistance to all acids and alkalies in solution (except concentrated HF). It can be flushed clean with steam or hot water. It is mechanically strong. It is genuinely economical.

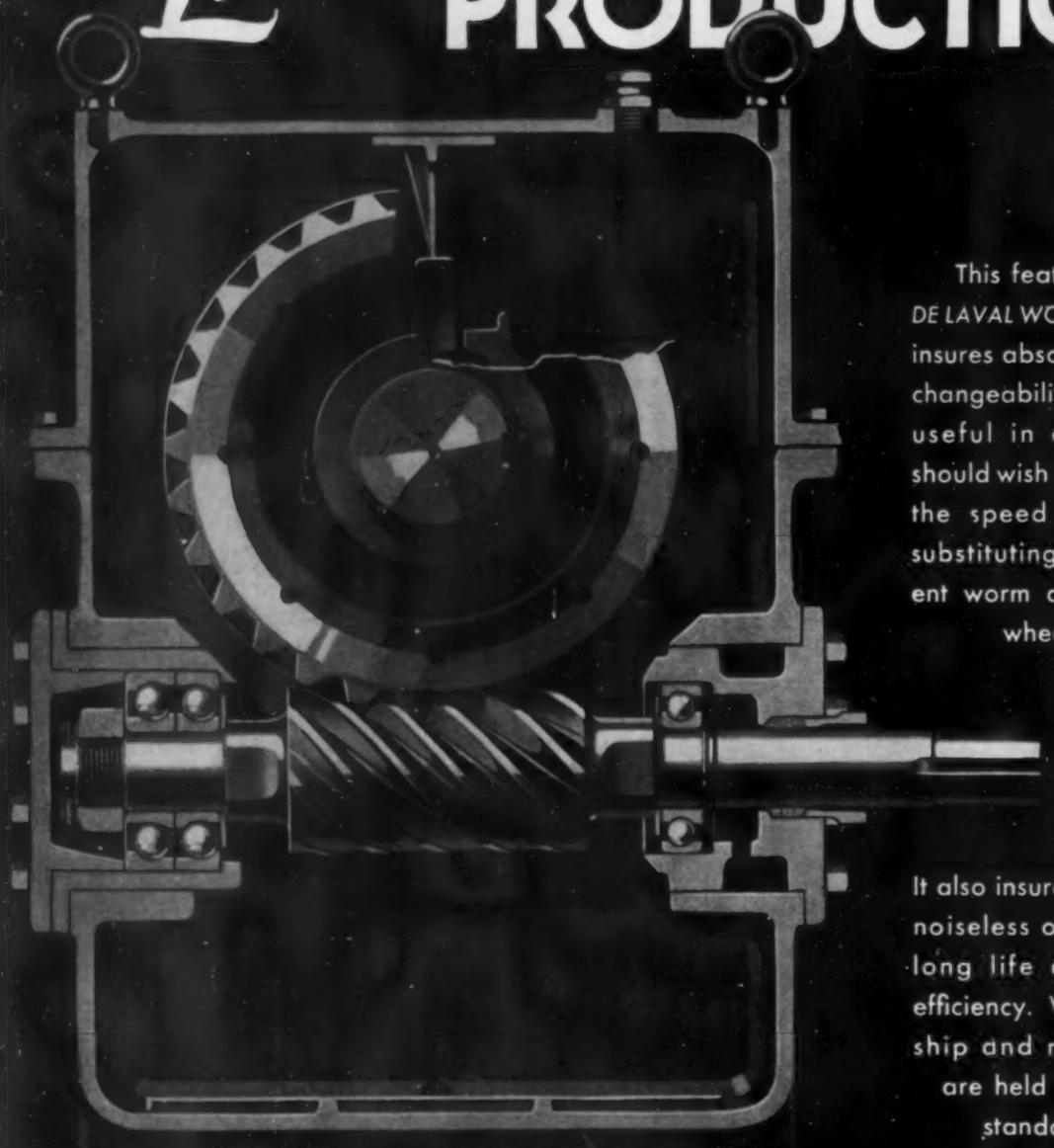
Why not let a Corning Engineer discuss these facts with you in relation to *your* piping problems?

Pyrex INDUSTRIAL GLASS
BRAND CORNING GLASS WORKS, CORNING, N.Y.

T.M. REG. PYREX U.S. PAT. OFF.

"PYREX" is a registered trade-mark and indicates manufacture by Corning Glass Works.

Limit Gage PRODUCTION



This feature of *DE LAVAL WORM GEARS* insures absolute interchangeability of parts, useful in case you should wish to change the speed ratio by substituting a different worm and worm wheel.

It also insures correct, noiseless operation, long life and high efficiency. Workmanship and materials are held to strict standards.

De Laval Steam Turbine Co.,
Trenton, New Jersey

DE LAVAL WORM GEARS

ONE OIL SOLVES ALL THREE OF THESE LUBRICATING PROBLEMS

● IN SPITE of the widely varying lubrication requirements on this turbine, reduction gear, and generator, Stanoil has held down the job of lubricating all of these units for three years and has established a record for economy.

The turbine and reduction gear were installed to drive a 25 cycle generator in a Wisconsin paper mill.* Lubricating the equipment presented the usual difficulty of lubricating three different units with one lubricating system. The reduction gear manufacturer desired an oil of different viscosity and type than that wanted by the turbine builder, but after discussion, a certain viscosity was agreed upon.

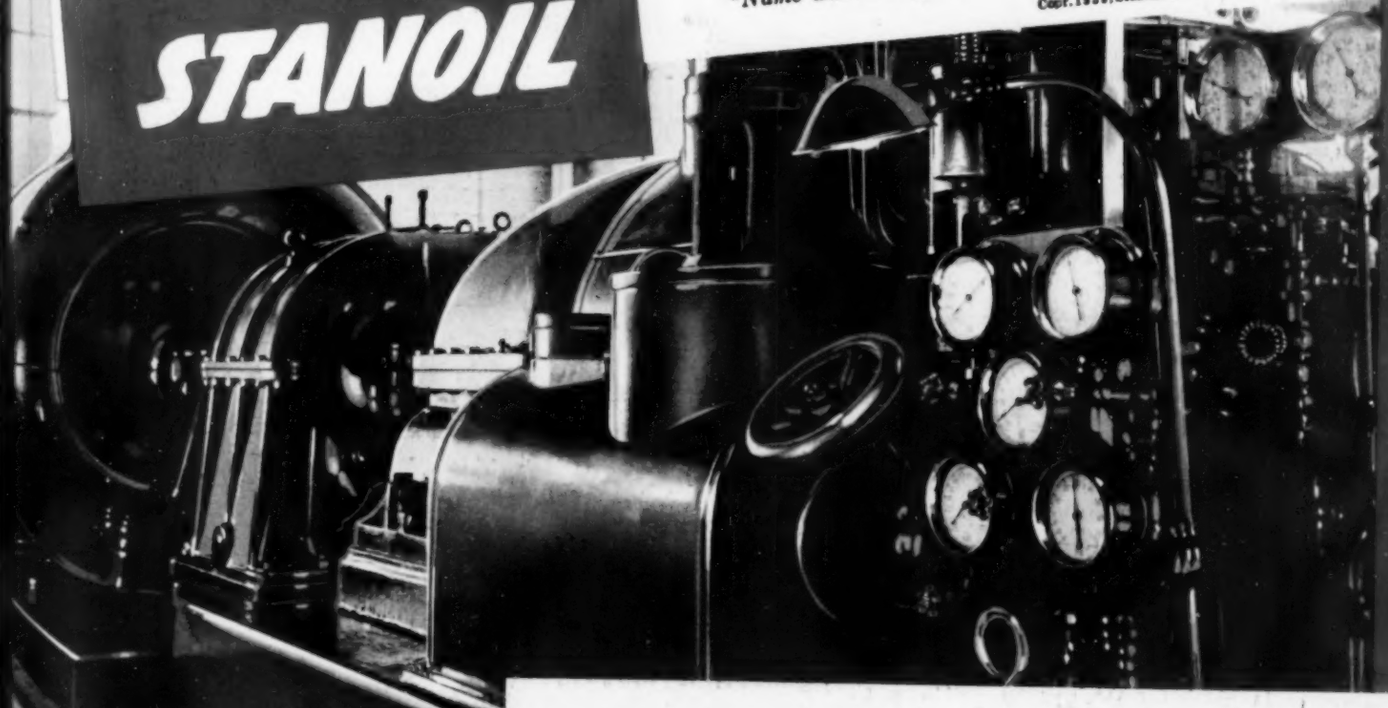
A Standard Lubrication Engineer was consulted. He explained how Stanoil would meet all the requirements on each of the units—it would resist high temperatures in the *turbine*, resist sludging or foaming under agitation in the *reduction gear*, and protect bearings under high pressure in the *generator*. All concerned agreed to give Stanoil a test. A recent inspection showed excellent lubrication of all parts on all three units.

Stanoil has many applications! Why not let a Standard Lubrication Engineer point out a few jobs in your plant where he thinks Stanoil can save money for you? Try it out. This service is available to all plant operators in the 13 Midwestern States served by these Engineers. It costs nothing. Phone the nearest Standard Oil (Indiana) office, or mail the card below for the Engineer in your locality.

**Name will be supplied on request.*

Copr. 1939, Standard Oil Co. (Ind.)

STANOIL



FIRST IN SERVICE
FOR FIFTY YEARS
STANDARD OIL (Ind.)

Postage Will Be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

FIRST CLASS PERMIT No. 252 (SEC. 510 P. L. & R.) CHICAGO, ILLINOIS

STANDARD OIL COMPANY (Ind.)

910 S. MICHIGAN AVENUE

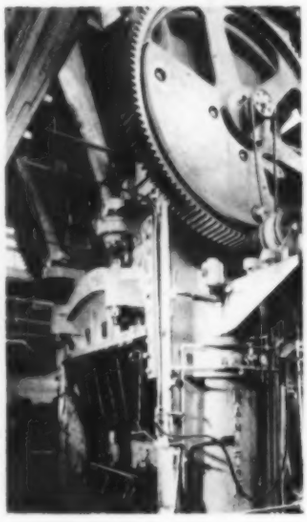
Mr. W. I. Nunn
Room 1218

CHICAGO, ILL.

BRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LU

ENGINEERING••LUBRICATION ENGINEERING••LUBRICATION ENGINEERING••LUBRICATION

Above: Spindle bearings on a cheese box machine in a Wisconsin plant, in which Superla Grease eliminated high consumption, leakage, and bearing fa



SUPERLA GREASE

Changing to Superla 2X grease for plain and anti-friction bearings saved about 50% in lubricating costs at the Metal Auto Parts plant in Indianapolis.

Superla 2X is used on the cups in the large forming presses. Superla No. 39 has proved "very satisfactory" in the centralized lubricating systems on these same presses after several years of operation.

It's a simple matter to find out whether you are getting rock-bottom cost in grease lubrication. Let a Standard Lubrication Engineer test Superla on just one bearing in your plant. It won't cost you a cent—you may save plenty.

KEEPS DIRT OUT KEEPS BEARINGS IN

On its first trial Superla Grease was given the job of lubricating the bearings on the box machine spindles shown above.

Before Superla was used, these bearings failed frequently. Excessive leakage and high consumption were also serious problems. With Superla, less grease is needed for adequate lubrication. It stays in the bearings and dirt stays out. And bearing failures stopped.

There's a Standard Lubrication Engineer at your service at any time to help you with bearing or other lubricating problems. Call your local Standard Oil (Indiana) office or write 910 South Michigan Avenue, Chicago, Illinois.

IS YOUR PLANT LOCATED IN ONE OF THESE 13 STATES?

GET THIS NEW LITERATURE

Two new interesting booklets on lubrication are available to all plant men in the 13 States shown on the map above.

"Spare the Time to Spare Your Machines," describes the latest development in a highly stable, long-lasting oil for many uses.

"How StanoCyl Cuts Oil Consumption," should be of interest to all power plant men concerned in the purchase or use of steam cylinder oil.

"The Lubrication Engineer—His Value to You," tells how these Engineers work and what they can do to help you reduce lubricating costs throughout your plant.

Check the subjects that interest you and mail the card. No postage is necessary.

STANDARD OIL COMPANY (Indiana) DECEMBER
910 S. Michigan Avenue, Chicago, Illinois.

Gentlemen: I am in one of your 13 Middle Western States.

- ☐ Have your Engineer call.
- ☐ Do not have your Engineer call, but please send me the booklet (s) checked:
- ☐ "Spare the Time to Spare Your Machines."
- ☐ "How StanoCyl Cuts Oil Consumption."
- ☐ "The Lubrication Engineer—His Value to You."

Name ..... *Position* .....

Company .....

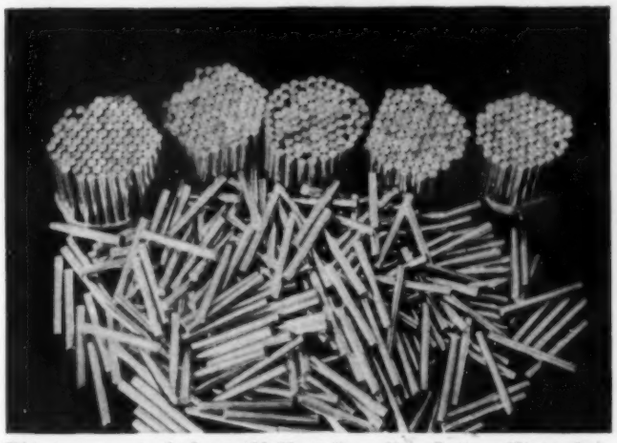
Address .....

City ..... *State* .....

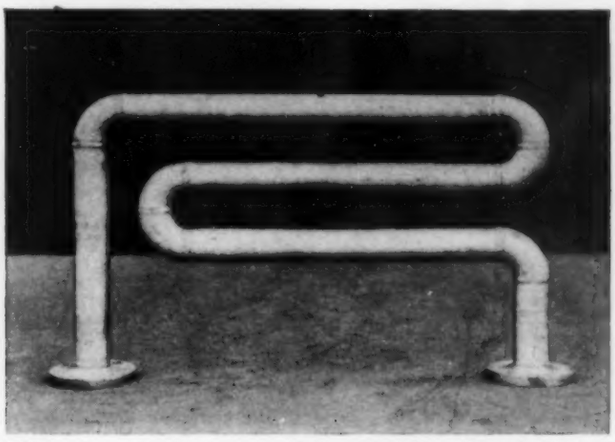
WHERE SEVERE CORROSION SHORTENS EQUIPMENT LIFE

use Hastelloy Alloys

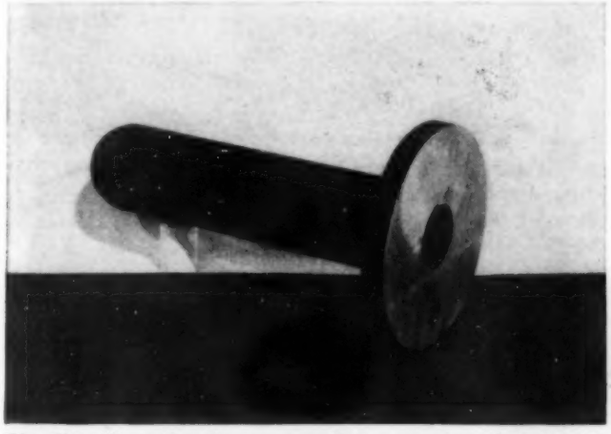
Each Hastelloy alloy has been developed for resisting certain severely corrosive materials, as explained in the box below. Write today for samples for test in your plant and for a copy of the 36-page book, "Hastelloy High-Strength Alloys for Corrosion Resistance." They will be sent without obligation.



This is a group of about 650 Hastelloy alloy C pins, 1⅝ in. long and 0.1842 in. in diameter, which have been centerless ground to a tolerance of plus 0.0005 in. minus 0.0000 in. for use in the manufacture of viscose rayon.



This coil, made of 2-in., extra-heavy Hastelloy alloy B pipe and 90-deg. bends joined by welding, is used to maintain a 20 per cent hydrochloric acid solution at 200 deg. F. in the manufacture of silverware.



This Hastelloy alloy D spray nozzle is part of a cobalt digester used in the manufacture of petroleum by-products. It is 2¼ in. in diameter and 10½ in. long with a 5¼-in. welded-on flange.

HASTELLOY ALLOY A is available as castings, rolled bars, sheet, plate, forgings, welded tubing, wire, and welding rod. It resists hydrochloric acid, sulphuric acid, acetic acid, formic acid, acid chlorides, organic chlorides, and hydrocarbons.

HASTELLOY ALLOY B is available as castings, rolled bars, sheet, plate, forgings, welded tubing, wire, and welding rod. It resists boiling hydrochloric acid, wet hydrochloric acid gas, acetic acid, formic acid, phosphoric acid, acid chlorides, and hydrocarbons.

HASTELLOY ALLOY C is available as castings and as welding rod. It resists free chlorine, hypochlorites, nitric acid, oxidizing acid mixtures, acid solutions of salts, hydrochloric acid, sulphuric acid, sulphurous acid, phosphoric acid, acetic acid, oxidizing agents, and flue gases.

HASTELLOY ALLOY D is available as castings and as welding rod. It resists sulphuric acid, hydrochloric acid (at moderate temperatures), phosphoric acid, acetic acid, formic acid, and acid solutions of salts.

HASTELLOY TRADE MARK

High-strength alloys for corrosion resistance

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

UCC

Chicago • Cleveland • Detroit • Houston • Los Angeles • New York • San Francisco • Tulsa

General Office and Works—Kokomo, Indiana

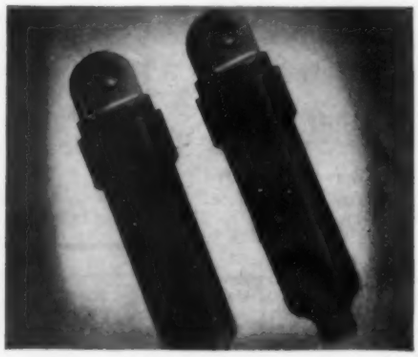
Foreign Sales Department—New York

The word "Hastelloy" is a registered trade-mark of Haynes Stellite Company.

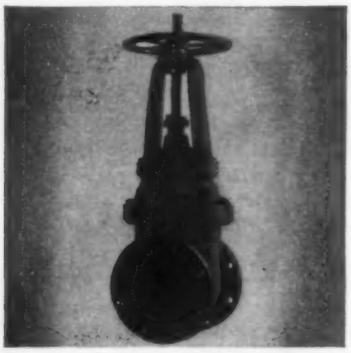
Conclusive Proof

Ace rubber lined stacks and flue ducts for carrying off fumes from spinning room and Ace rubber covered and lined blowers provide complete protection against acid fumes. Ace rubber lined fume systems are light, portable and made in standard units for easy installation.

Over 12 miles of Ace hard rubber pipe in sizes 1½ to 8 inches.



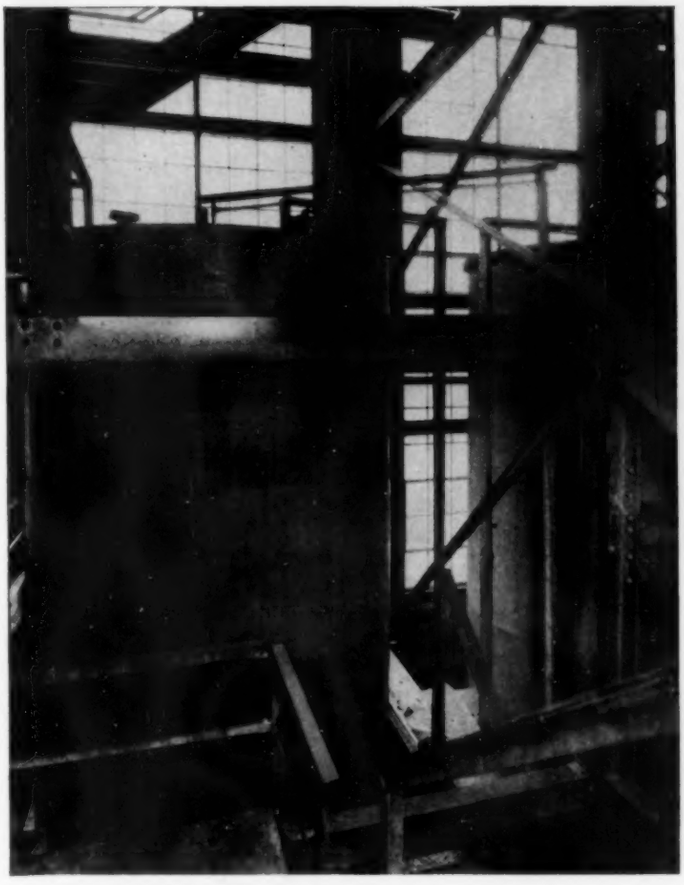
Special Ace hard rubber molded parts for the Rayon Industry include lifter arms, spinning buckets, candle filters, spinnerette parts and hard rubber trays for coagulating and other baths, etc.



Ace hard rubber lined gate valve with outside yoke and stem. Made in sizes from 2 to 20 in., except 2½ in.

AMERICAN HARD RUBBER COMPANY, 11 MERCER STREET

ACE HARD RUBBER AND ACE RUBBER LINED EQUIPMENT PREVENTS CORROSION AND CONTAMINATION....



Ace rubber lined acid storage tanks are made in all sizes. Ace rubber lined wash tanks, bleach and other process and storage tanks, are available.

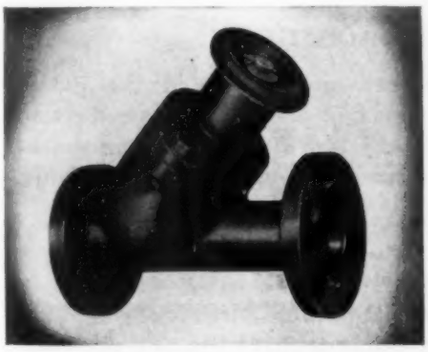
• The largest Rayon Manufacturers in this country use ACE RUBBER EQUIPMENT in their plants to prevent corrosion and contamination.

Improvement in design of Ace Hard Rubber Equipment, and technique of installation, has removed many of the previous limitations of hard rubber pipe and fittings. To-day this equipment can be made to perform far beyond what was possible a few years ago.

Ace Rubber Lined Equipment is gaining wider acceptance and is replacing other acid resisting materials to a greater extent than ever before in spinning rooms, processing, acid baths and recovery systems.

ACE Rubber Protection has a definite place in the Rayon Industry and our Engineers will be glad to work with you in the solution of difficult corrosion and contamination problems.

In addition to Ace Rubber Protection we specialize in Neoprene and Thiokol lined equipment.



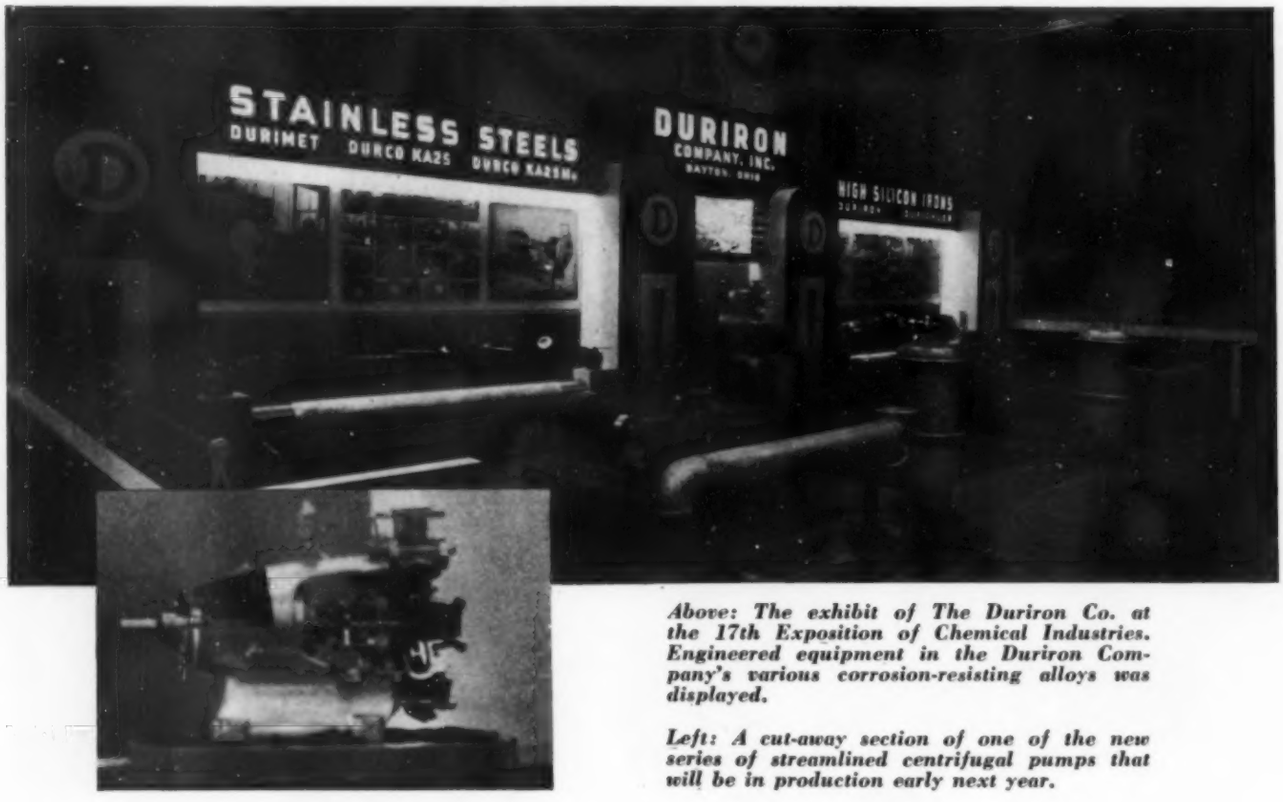
Ace rubber lined angle diaphragm valve. Furnished in sizes 1½ to 4 inches.

Ace hard and soft rubber lined diaphragm valves. Stocked in sizes from 1 to 6 inches. Sizes from ¾ to 12 inches available.

Ace hard rubber flexible pail in 3 gallon size. Made of a compound that is tough and will stand up in any usual service.

NEW YORK, N. Y. • • CHICAGO, ILL. • • AKRON, OHIO

Duriron Company *displays engineered equipment and alloys for resistance to corrosion*



Above: The exhibit of The Duriron Co. at the 17th Exposition of Chemical Industries. Engineered equipment in the Duriron Company's various corrosion-resisting alloys was displayed.

Left: A cut-away section of one of the new series of streamlined centrifugal pumps that will be in production early next year.

Constant improvement of products and continuous research in corrosion-resisting alloys has long been the policy of The Duriron Company.

Evidence of the progress made throughout a period covering more than a quarter of a century of operation under this policy was displayed at the 17th Exposition of Chemical Industries.

DURIRON AND DURICHLOR CASTINGS

Duriron denitrating and bleaching towers, S-bend condenser tubes and nitric boiler tubes indicated the foundry technique gained through years of practice and experience in producing high silicon iron castings.

ENGINEERED EQUIPMENT

Pumps, valves, fans and other equipment evidenced highly specialized engineering knowledge of equipment and materials of construction. Improvement in design was demonstrated by the samples of a new line of corrosion-resisting centrifugal pumps that will be in production the early part of next year.

STAINLESS STEELS

Metallurgical research and the high degree of foundry skill was shown by the many and various castings and pieces of finished equipment in the stainless steels, produced by the Stainless Steel Division.

FACILITIES

Photograph enlargements illustrated the extensive facilities of the Company for the production and finishing of any size or type of equipment needed for the handling of corrosive liquids, vapors or gases.

The facilities of both the High Silicon Iron Division and the Stainless Steel Division are complete. The Company will be glad to discuss with you the application of any of their alloys and corrosion-resisting products for your use. Write THE DURIRON COMPANY, 424 N. Findlay St., Dayton, Ohio.

for sparkling clarity—use "Carbitol" solvents

Complete solubility can be imparted to a variety of compounded products by the use of Butyl "Carbitol" solvent. This desirable property gives clearness and uniformity to many mixtures which ordinarily do not go into complete solution. It helps to overcome the adverse effect on sales caused by cloudiness or separation which often brand a product as inferior. Furthermore, laborious and lengthy stirring operations have often been reduced after incorporating Butyl "Carbitol" . . . This is one of many applications which illustrate how "Carbitol" solvents are helping manufacturers of cutting oils, insecticides and leather compounds to improve products. Perhaps the uses below may suggest other ways which you can profitably apply them in your industry:

Plasticizers

Esters made from "Carbitol" solvents and dibasic acids are plasticizers with unusually low solubility in hydrocarbons. For instance, "Carbitol" phthalate, one of the best cellulose ester and vinyl resin plasticizers, is practically insoluble in mineral oil.

Textiles

Its low vapor pressure (b.p. 201.9° C.) and ability to penetrate textile fibers make "Carbitol" well suited for setting twist and conditioning yarns and cloth.

Cosmetics

"Carbitol" solvent is incorporated with excellent results in cosmetic emulsions as a softening and moistening agent and a carrier of perfumes. Unlike other hygroscopic agents, it does not cause stickiness.

Printing Inks

The evaporation rate of "Carbitol" Acetate (b.p. 217.7° C.) is slow enough to prevent gumming on the print rolls, but fast enough for printing operations.

In addition to "Carbitol" compounds we supply more than 150 other chemicals, including solvents, intermediates, and other products vital to industry. For instance:

Butyl Alcohol is widely used as a solvent in the manufacture of lacquers and thinners. It lowers the viscosity of lacquers, which permits better flow-out and leveling. Also it is used for defoaming, coupling immiscible substances, and in making ore flotation agents.

For information concerning the use of "Carbitol" solvents, address:

CARBIDE AND CARBON CHEMICALS CORPORATION

Unit of Union Carbide and Carbon Corporation

UCC

30 East 42nd Street, New York, N. Y.

PRODUCERS OF SYNTHETIC ORGANIC CHEMICALS

The word "Carbitol" is a registered trade-mark of Carbide and Carbon Chemicals Corporation.

The Asplund DEFIBRATOR

for economical defibering of ligno-cellulose materials used for the manufacture of

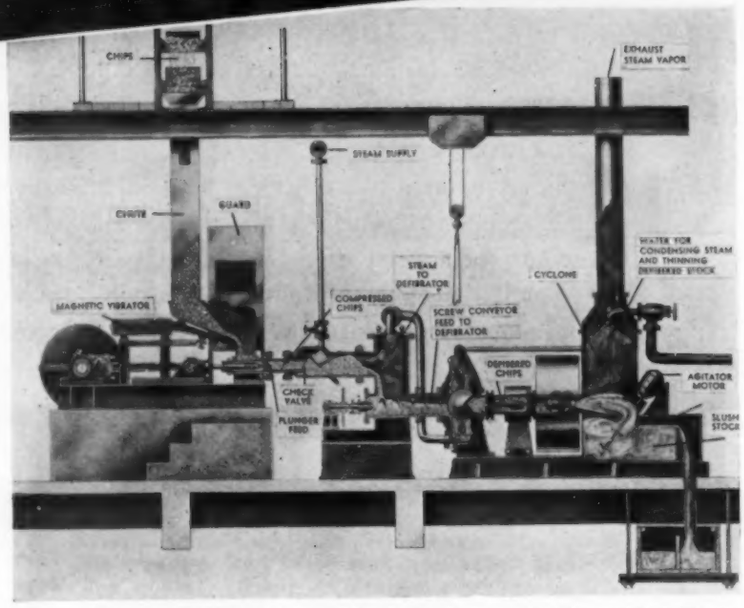
WALL AND INSULATING BOARD ★ ROOFING AND FLOORING FELTS ★ MOLDED WOOD PRODUCTS ★ PLASTICS ★ AND USED AS A FILLER IN OTHER NEW PRODUCTS

Whether you produce pulps or fibers from wood chips, saw mill waste, sugar cane, bamboo, oat, cornstalks, flax straw, wheat and other straws, or buy finished chemical pulps, it will pay you to learn about the many utility and economy advantages of the Asplund DEFIBRATOR. For here is an advanced process which has radically changed the existing methods of manufacturing pulps and fibers heretofore produced mechanically.

The Asplund fiber has entirely new characteristics which have resulted in improving the quality and reducing the cost of production of a wide variety of products manufactured in the process industries.

Several advantages of the DEFIBRATOR are:

Continuous operation.
Economical operation.
Low power consumption.
Homogeneous pulp.
No chemical action . . . No waste.
Helps increase production.
Assures uniform product.
Extremely free pulp.
Maximum yield about 98%.
Adjustable to produce fibers of desired character.
Results can be easily duplicated.



Flofoto of the DEFIBRATOR used for defibering wood chips. (U. S. Patent Numbers: 2,145,851—2,008,892—2,047,170. Canadian Patent Numbers: 337,404—335,302—355,303.) Patented in Foreign Countries.

Over 150 machines in satisfactory operation in United States and foreign countries. A New catalog, describing and illustrating the DEFIBRATOR, mailed upon request.

R. D. KEHOE, *Agent*

AMERICAN DEFIBRATOR, INC.

NEW YORK, N. Y.

●

Address inquiries to

R. D. Kehoe, PAPER & INDUSTRIAL APPLIANCES, Inc.
122 East 42nd Street New York, N. Y.

Gentlemen:

Without obligation, please inform us how the Asplund DEFIBRATOR can be utilized to advantage in our plant for the manufacture of:.....
Company.....
Name..... Title.....
Address.....City.....State..... CM-12

PLUS USEFULNESS

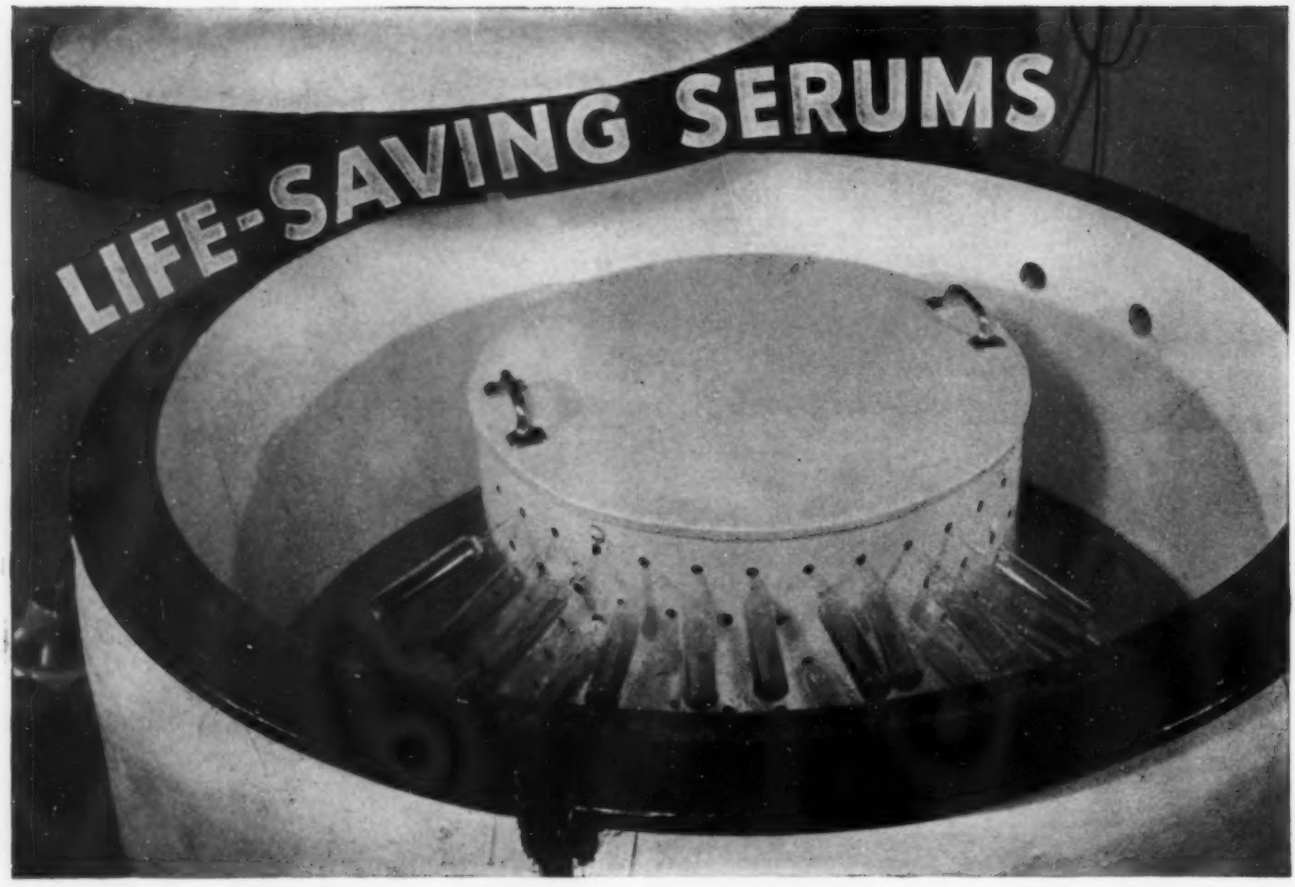
IN THE B & L WIDE FIELD BINOCULAR MICROSCOPE

The wide field at all magnifications is just one advantage of the B&L Wide Field Binocular Microscope. Other B&L features include the long working distance and the patented revolving Drum Nosepiece with paired objectives. These are features that mean *plus* usefulness in the laboratory or field.

The B&L Wide Field Binocular Microscope shows an erect, unreversed three dimensional image magnified up to 150X. Three types of stands adapt it to varying requirements. For full details write Bausch & Lomb Optical Co., 605 St. Paul St., Rochester, N. Y.

BAUSCH & LOMB

FOR YOUR EYES, INSIST ON BAUSCH & LOMB EYEWEAR, MADE FROM BAUSCH & LOMB GLASS TO BAUSCH & LOMB HIGH STANDARDS OF PRECISION . . . . . .



Higher Vacuum for Science and Industry

ABOVE. Cryochem apparatus, for rapidly dehydrating from the frozen state, very sensitive biological and pharmaceutical materials under high vacuum. The process preserves breast milk, serums, viruses, vaccines and similar substances for long periods.

BELOW. 5′ diameter by 32′ long Rotary Vacuum Dryer. Aluminum and Stainless Steel. Weight 17 tons, A. S. M. E. specifications. Largest recorded aluminum process vessel. Removes water at 75° F.

Stokes engineering has made the use of higher vacuum economically practicable for applications ranging all the way from scientific apparatus for Cryochemic processing up to chemical equipment capable of handling tons of material per charge.

We have developed equipment which makes it easier to obtain the higher vacuum (within a fraction of a millimeter of absolute) needed for complete desiccation in biological, chemical and other processes . . . equipment for distilling high-boiling-point liquids; to combine operations such as extracting, drying and solvent recovery; to prevent oxidation; for handling heat-sensitive materials and to utilize exhaust steam for processing purposes.

Higher Vacuum may be the answer to some of your problems. We invite your inquiries and will gladly make recommendations, backed by our more than 35 years' experience as specialists in this field.

F. J. STOKES MACHINE COMPANY
5920 Tabor Road Olney P. O. Philadelphia, Pa.
Representatives in New York, Chicago, Cincinnati, St. Louis
Pacific Coast Representative · L. H. Butcher Company, Inc.

F.J.Stokes **PROCESSING EQUIPMENT** **FJS Est. 1895**

7 HARD YEARS ON THE JOB WITH...

NO TIME-OUTS

FOR REPAIRS!

Another true case history from the Allis-Chalmers files that proves **"IT PAYS TO BUY THE EQUIPMENT THAT PAYS FOR ITSELF!"**

Here's a Tip from President Walter A. Zinn, Milwaukee Western Malt Co., on How to Cut Motor Repair Bills! Find Out What Full Measure Construction in Lo-Maintenance Motors Can Mean to You . . . in Lower Costs . . . in Less Man Hours Lost!

OPERATING 24 HOURS A DAY AT The Milwaukee Western Malt Company plant . . . in air that's hot and humid . . . this Allis-Chalmers Lo-Maintenance Motor is typical of the 86 that were seven hard years on the job with no time outs for repairs!

If you were building a new addition to your plant . . . if you wanted to double your capacity . . . get a better product at lower cost . . . you'd want to be sure every piece of equipment you bought held up its end of the job . . . without stopping production . . . without running up excessive maintenance costs!

That's what Walter A. Zinn was looking for when he expanded his plant in 1932. And because Mr. Zinn, besides being president of the Milwaukee Western Malt Co., is also an engineer and had designed many of the new plant's production features . . . he was mighty particular about the motors he was choosing.

"When you turn out 2,600,000 bushels of malt a year," said Mr. Zinn, "you've got to keep production rolling. You can't afford time-outs for motor repairs. That's why I turned the motor job over to Allis-Chalmers.

No Repair Bills!

"And I wasn't wrong by a long shot! In the seven years they have been running in my plant, the only thing those Allis-Chalmers Motors haven't given us is costly repair bills!"

That's what Mr. Zinn and hundreds of other executives say about Lo-Maintenance Motors. And that's what you'll say about Lo-Maintenance Motors once you put them to work for you!

There's more than just a rated horsepower in the Full Measure Construction of Lo-Maintenance Motors. High carbon steel frame . . . indestructible rotor and distortionless stator . . . plus Allis-Chalmers 90 years of working hand-in-hand with industry . . . these are extra value features that give you extra years of trouble-free service!

Get in touch with the trained production engineer in the nearest Allis-Chalmers district office! Let him show you how you can cut costs . . . keep production steady with Allis-Chalmers Lo-Maintenance Motors!

1096

. . . 90 Years of Engineering Superiority Work for You When You Specify Allis-Chalmers!

ELECTRICAL DIVISION

ALLIS-CHALMERS

MILWAUKEE · WISCONSIN

"PREVENTIVE MAINTENANCE keeps our piping costs down"

ACTUALLY, it's nothing new—many hundreds of plants are doing it every day. It's just a matter of using good foresight when you're buying valves and fittings.

Preventive Maintenance is simply this: It means fortifying your piping with extra resistance to the stress and strain of service conditions. There lies your greatest assurance of dependable flow control at minimum cost. And it means making sure that your piping equipment is right for the job to be done—right for the safety required.

Whether your plant is small or large—with Crane valves and fittings you can carry on a successful program of Preventive Maintenance. That's because in Crane-Quality you get the finest development of design and materials in flow-control equipment. And in the Crane line of over 38,000 items is exactly the one you need for efficient and economical piping in every application in your system.

Just as he has helped others, your Crane Representative will gladly work with you. Through him, Crane's vast experience in solving industry's piping problems is applied to your individual case. Back of him, at your service, are Crane's extensive resources of technical knowledge, Crane's elaborate research and plant facilities.

If you *now* have a piping problem that's giving you headaches, then get started *now* on a Preventive Maintenance program. You'll save many dollars—you'll have peace of mind. Call your Crane Representative today.

CRANE

CRANE CO., GENERAL OFFICES
836 S. MICHIGAN AVE., CHICAGO
VALVES • FITTINGS • PIPE
PLUMBING • HEATING • PUMPS

NATION-WIDE SERVICE THROUGH BRANCHES AND WHOLESALERS IN ALL MARKETS

MASTER
Master
THE MASTER ELECTRIC COMPANY • DAYTON, OHIO

Known Analysis . . Certified Quality . . Aids Chemical Engineers

The more difficult your requirements, the more reason for using Ryerson Certified Steels. If an alloy steel is involved, Ryerson will send accurate data, including exact chemical and physical properties, grain size and heat treatment response of the steel shipped.

The wide range of stainless, heat and corrosion resisting steels carried, makes it possible to select many special compositions from stock. Under the Certified Steel Plan, all Ryerson steels, whether plain carbon steel bars, galvanized sheets or cold drawn tubing, are closely controlled as to chemical content, accuracy, finish, etc.—all without the slightest increase in price.

You can be sure of uniform, high quality. When you need steel for any purpose, check with the nearest Ryerson Steel-Service Plant — shipment is immediate. Joseph T. Ryerson & Son, Inc. Plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

Ryerson Products Include:

Beams, Structurals
Channels, Angles, Tees, Zees
Hot Rolled Bars
Bands and Hoops
Floor Plate
Plates (over 15 kinds)
Sheets (over 25 kinds)
Alloy and Tool Steels
Heat Treated Alloy Bars
Stainless Steel
Cold Finished Shafting
Strip Steel, Flat Wire
Mechanical Tubing
Boiler Tubes and Fittings
Welding Rod
Rivets, Bolts, Nuts, Washers
Concrete Reinforcing
Babbitt Metal and Solder
Write for Stock List

RYERSON

RYERSON CERTIFIED STEELS

VC CHEMICALS

HAND IN HAND *-with Industry-*

We at the Virginia-Carolina Chemical Corporation take pride in the fact that V-C pioneered in the phosphate field, producing the first phosphate ores mined in this country . . . but it is with even greater pride that we have worked hand in hand with Industry, contributing substantially to the broad developments in the role of *"Phosphorus Mirabilis"* in technical, food, drug, and commercial fields. V-C produces all grades of the beneficent *Phosphoric Acid* . . . and our technical staff and development laboratories will gladly assist in determining its adaptability to your processes.

SALES OFFICES: Atlanta, Ga.; Baltimore, Md.; Carteret, N. J.; Charleston, S. C.; Cincinnati, Ohio; Columbia, S. C.; Greensboro, N. C.; Jackson, Miss.; Little Rock, Ark.; Memphis, Tenn.; Montgomery, Ala.; Norfolk, Va.; Orlando, Fla.; Richmond, Va.; Shreveport, La.; St. Louis, Mo.; Savannah, Ga.; Wilmington, N. C.

VIRGINIA-CAROLINA CHEMICAL CORPORATION
RICHMOND, VIRGINIA

V-C 85% Technical Phosphoric Acid is sufficiently pure to make practical the replacement of the USP grade in many operations, effecting substantial savings.

PHOSPHORIC ACIDS — CALCIUM PHOSPHATES
SODIUM PHOSPHATES — SULPHURIC ACID — SPECIAL PHOSPHATES AND COMPOUNDS . . . Also distributors of heavy chemicals

THIS IS A HIGHLY REACTIVE ALUMINA

It is called *Gelatinous Alumina*. The photograph shows it fresh from the filter press, as it looks in the commercial form, pure white, translucent, and with a soft, creamy texture.

Being a hydrogel with a high water content, Gelatinous Alumina is the most reactive oxide of Aluminum. It is a good starting point for preparing other Aluminum compounds.

For example, under the proper conditions Gelatinous Alumina reacts *directly* with weak organic acids to form compounds such as Aluminum Stearate. The only by-product of these reactions is water; no separation or purification is required.

Gelatinous Alumina is an effective surfacer for titanium pigments. Neutral, stable, odorless, and translucent, its properties are of interest to manufacturers of cosmetics and pharmaceuticals.

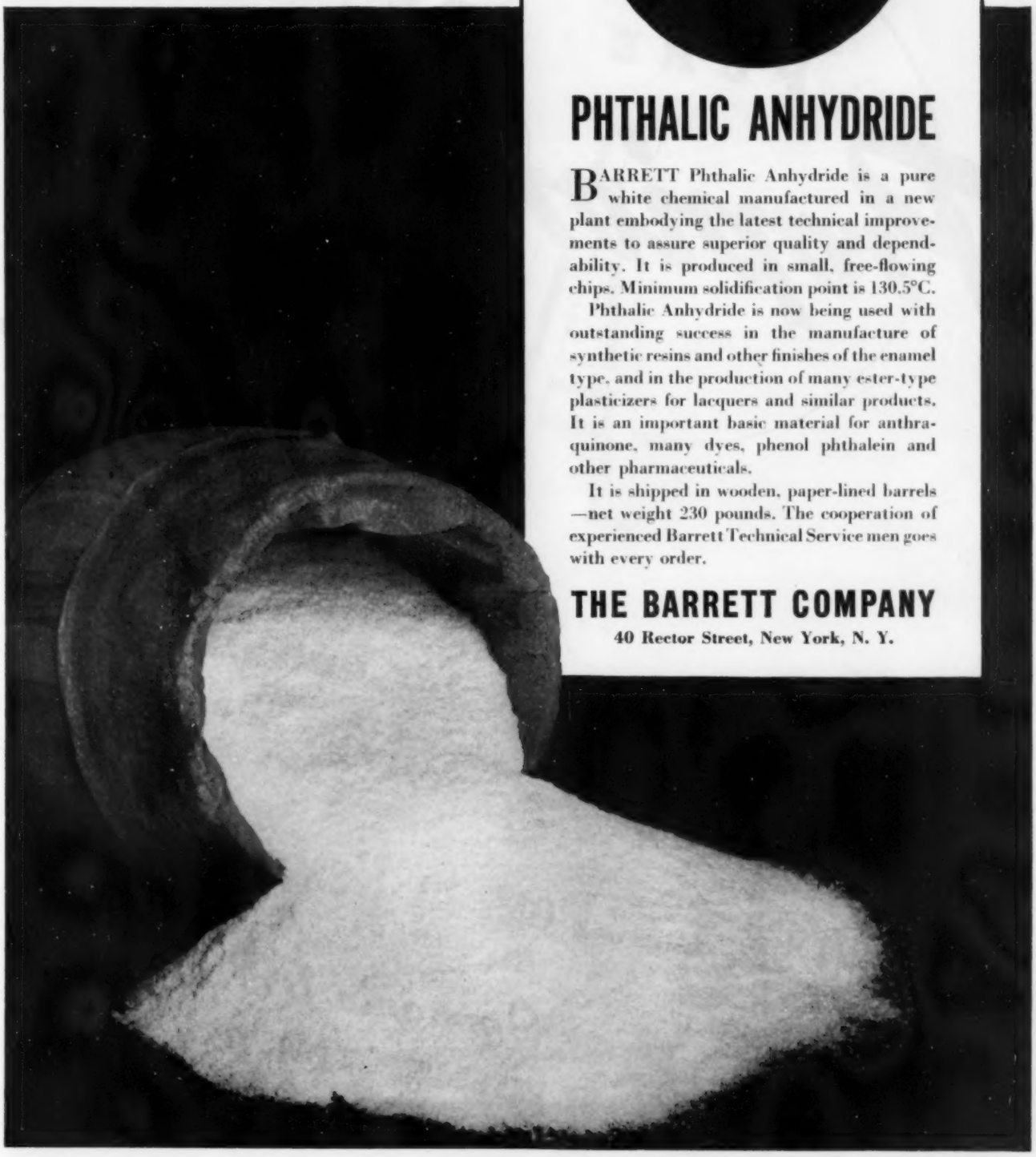
This Alumina is one of many new Aluminum and Fluorine compounds which our laboratories are developing. Our technical men will be glad to answer your inquiries regarding them. ALUMINUM ORE COMPANY. (*Sales Agent:* ALUMINUM COMPANY OF AMERICA, 1910 Gulf Bldg., Pittsburgh, Pa.)

ALORCO

ALUMINUM ORE COMPANY

ALUMINUM AND FLUORINE COMPOUNDS

Barrett
CHEMICALS



PHTHALIC ANHYDRIDE

BARRETT Phthalic Anhydride is a pure white chemical manufactured in a new plant embodying the latest technical improvements to assure superior quality and dependability. It is produced in small, free-flowing chips. Minimum solidification point is 130.5°C.

Phthalic Anhydride is now being used with outstanding success in the manufacture of synthetic resins and other finishes of the enamel type, and in the production of many ester-type plasticizers for lacquers and similar products. It is an important basic material for anthraquinone, many dyes, phenol phthalein and other pharmaceuticals.

It is shipped in wooden, paper-lined barrels —net weight 230 pounds. The cooperation of experienced Barrett Technical Service men goes with every order.

THE BARRETT COMPANY
40 Rector Street, New York, N. Y.

America's leading manufacturer of coal-tar chemicals **ROOFINGS · TARVIA · CHEMICALS**

HIGH-PRESSURE CHEMICALS SYNTHETIC

PURE · SYNTHETIC

Propionic ACID

...now available in tank-car quantities

◆ ◆ ◆

DU PONT
REG. U.S. PAT. OFF.

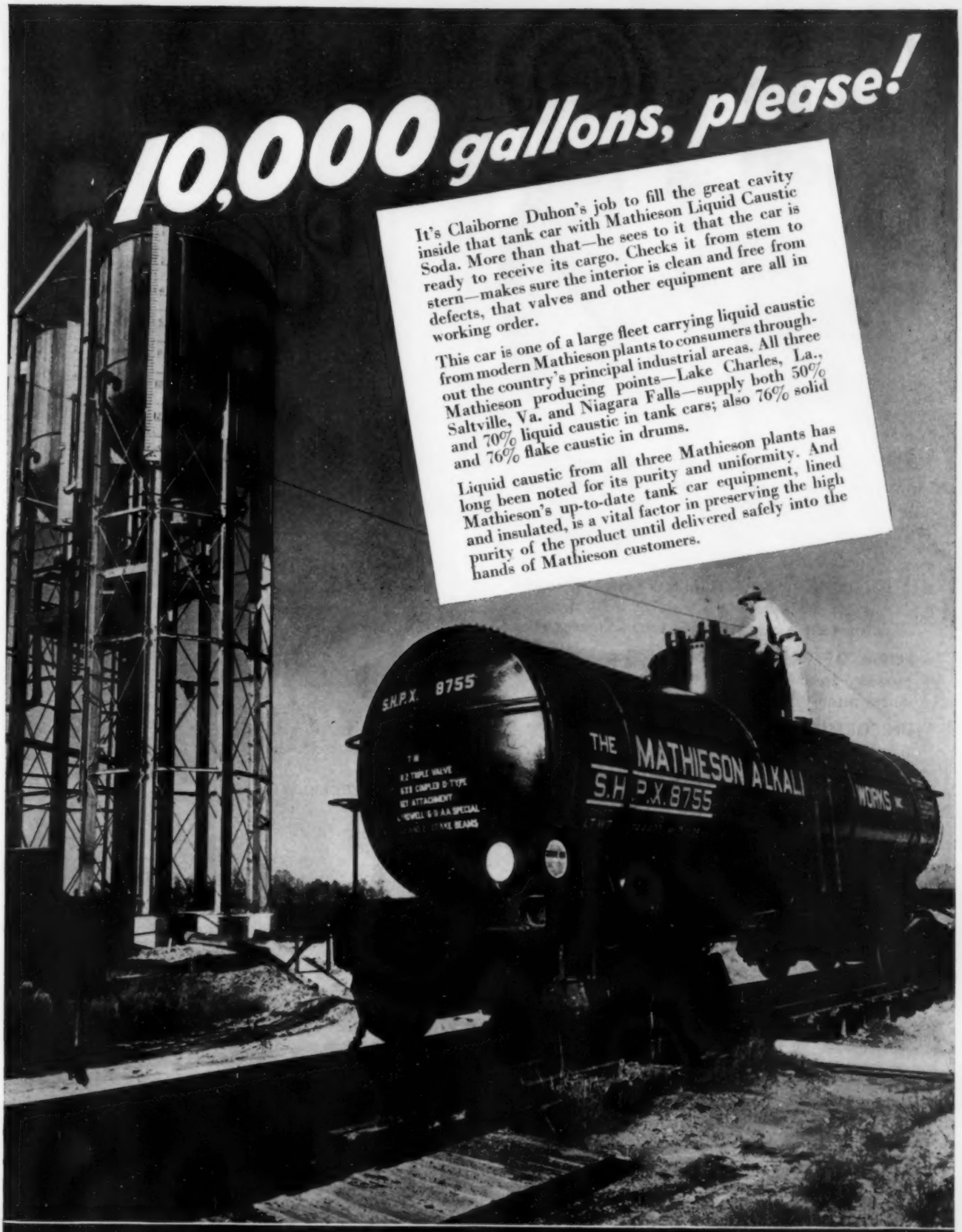
E. I. DU PONT DE NEMOURS & CO.
INCORPORATED
Ammonia Department
WILMINGTON, DELAWARE

10,000 gallons, please!

It's Claiborne Duhon's job to fill the great cavity inside that tank car with Mathieson Liquid Caustic Soda. More than that—he sees to it that the car is ready to receive its cargo. Checks it from stem to stern—makes sure the interior is clean and free from defects, that valves and other equipment are all in working order.

This car is one of a large fleet carrying liquid caustic from modern Mathieson plants to consumers throughout the country's principal industrial areas. All three Mathieson producing points—Lake Charles, La., Saltville, Va. and Niagara Falls—supply both 50% and 70% liquid caustic in tank cars; also 76% solid and 76% flake caustic in drums.

Liquid caustic from all three Mathieson plants has long been noted for its purity and uniformity. And Mathieson's up-to-date tank car equipment, lined and insulated, is a vital factor in preserving the high purity of the product until delivered safely into the hands of Mathieson customers.



Mathieson Chemicals

THE MATHIESON ALKALI WORKS (INC.)
60 E. 42ND STREET, NEW YORK, N. Y.

SODA ASH . . . CAUSTIC SODA . . . BICARBONATE OF SODA . . . LIQUID CHLORINE . . . BLEACHING POWDER . . . HTH PRODUCTS . . . AMMONIA, ANHYDROUS and AQUA . . . FUSED ALKALI PRODUCTS . . . CCH (INDUSTRIAL HYPOCHLORITE) . . . DRY ICE . . . CARBONIC GAS . . . ANALYTICAL SODIUM CHLORITE

HIT OR MISS METHODS . . .

Hit or miss methods of selecting soda ash, caustic soda, and other alkalies you require for making your product have gone out of date.

Today, there are five important requirements to be considered when you place your order for an alkali . . .

QUALITY—Solvay Alkali quality is assured. The oldest and largest alkali producer . . . Solvay Alkalies have established the quality standards for alkalies for years.

FORM OF PRODUCT—Many Solvay Alkalies are produced in various forms to meet your specific requirements.

UNIFORMITY—No hit or miss methods here—Solvay Alkalies are always as specified!

DISTRIBUTION—Three huge Solvay Plants in important industrial centers and many stock points assure efficient and on time deliveries.

SERVICE—Do you have problems in alkalies? Solvay Technical and Engineering Service Division is maintained to help you.

SOLVAY SALES CORPORATION

Alkalies and Chemical Products Manufactured by The Solvay Process Company

40 RECTOR STREET NEW YORK, N. Y.

BRANCH SALES OFFICES:
Boston • Charlotte • Chicago • Cincinnati
Cleveland • Detroit • Indianapolis
New Orleans • New York • Philadelphia
Pittsburgh • St. Louis • Syracuse

SOLVAY SALES CORPORATION
40 Rector Street, New York, N. Y.

Please send me a copy of the Solvay Products Book which will give me complete information on all Solvay Products.

Name.....

Firm.....

Address.....

City..... *State*..... AC-12

IN THESE TIMES OF APPLIED SCIENCE, THE USE OF CHEMICALS EVOLVES FROM THE GENERAL TO THE PARTICULAR . . . FROM THEIR BROAD, BASIC EMPLOYMENT TO SPECIFIC PURPOSES.

IF THE KNOWLEDGE IN OUR DEFINITE FIELD, ACCUMULATED FOR MORE THAN FORTY YEARS, IS OF POTENTIAL VALUE TO YOU, PLEASE WRITE TO US. ENQUIRIES ARE RECEIVED, STUDIED, AND THEIR POSSIBILITIES INVESTIGATED IN STRICTEST CONFIDENCE.

OLDBURY

ELECTRO-CHEMICAL

COMPANY

Plant and Main Office:
NIAGARA FALLS, NEW YORK

New York Office:
22 EAST 40TH ST., NEW YORK CITY

Phosphorus and phosphorus products. Sodium chlorate. Potassium perchlorate. Oxalic acid.

VICTOR

HEADQUARTERS FOR pHOSPHATES

SEND FOR CATALOG OF VICTOR *Chemicals*

PHOSPHORUS

Nomenclature—Phosphorus
Yellow phosphorus
White phosphorus

Chemical Formula—P_4

Properties—Yellow phosphorus is an exceedingly poisonous, light yellow, wax-like, semi-transparent solid very closely resembling beeswax in appearance. Upon exposure to air it spontaneously ignites and burns to form P_2O_5. Phosphorus is soluble in carbon bisulphide and relatively insoluble in almost all other substances. It is always stored or shipped under water.

Uses of Yellow Phosphorus—Manufacture of phosphorus chlorides, sulphides, hypophosphites, phosphor-copper, phosphoric acid, phosphoric anhydride. Also for smoke screens; sky writing, pyrotechnics, rat poison, and in organic synthesis.

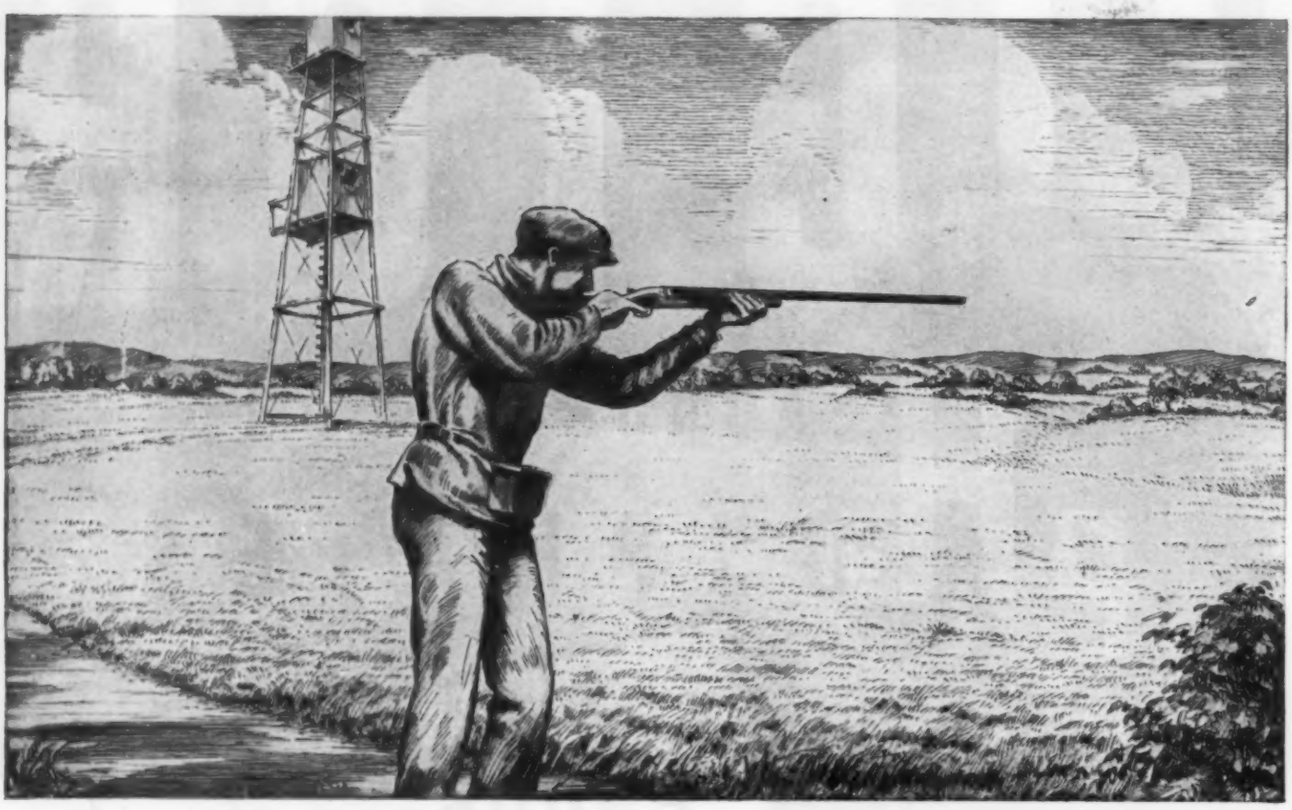
Victor Phosphorus—Noted for extreme purity. With the recent completion of an electric furnace at Mt. Pleasant, Tenn., Victor alone produces phosphorus by both the blast furnace and electric furnace methods.

VICTOR CHEMICAL WORKS
BOARD OF TRADE BUILDING
CHICAGO, ILL.

VICTOR CHEMICALS

Phosphoric Acid
Pyrophosphoric Acid
Polyphosphoric Acid
Metaphosphoric Acid
Phosphorus
Phosphoric Anhydride
Phosphorous Acid
Alkylphosphoric Acids
Ammonium Hexaphosphate Dinitride
Ammonium Phosphates
Alkyl Ammonium Phosphates
Fireproofing Compounds
Calcium Phosphates
Magnesium Phosphates
Potassium Phosphates
Sodium Phosphates
Sodium Pyrophosphates
Potassium Pyrophosphate
Sodium Metaphosphate
Alkyl Acid Pyrophosphates
Formic Acid
Aluminum Formate
Nickel Formate
Sodium Formate
Sodium Baroformate
Oxalic Acid
Calcium Oxalate
Sodium Oxalate
Magnesium Sulphate
Sodium Aluminum Sulphate
Ferrophosphorus
Triple Superphosphate

INTERESTING USES OF ALKALIES



A Vital Step In The Manufacture Of Smokeless Powder

Smokeless nitrocellulose powder has largely replaced the black potassium nitrate powders for shotgun shells and rifle cartridges. In the preparation of nitrocellulose for this purpose, caustic soda plays a vital part. Before the cellulose can be converted into its nitro compound the fats and oils from the raw cotton are removed by the use of caustic soda in the ratio of about 2% to the weight of the raw cotton.

Because the function of alkalies in manufacturing industries is seldom recognized in the finished product, the average layman has little conception of the tremendous tonnage of caustic soda, soda ash, liquid chlorine and bicarbonate of soda used in manufacturing such important commodities as chemicals, paper, soap, textiles, glass, foods and drugs. Neither does he realize how numerous and how varied are the uses made of these alkalies. Some of the more or less obscure and minor uses have been depicted in this series of advertisements here concluded.

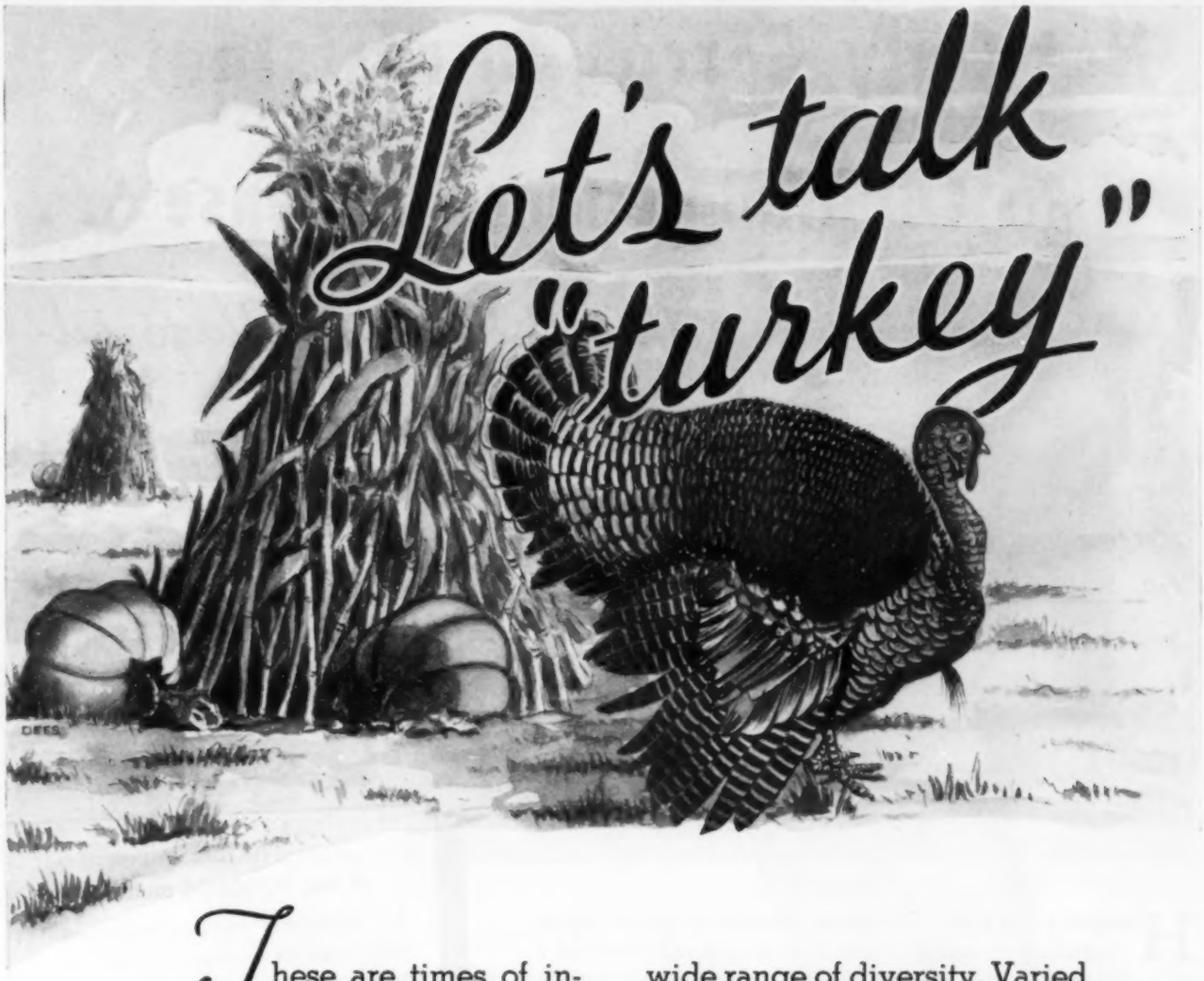
We have taken this novel way of bringing the name COLUMBIA to the attention of executives, technicians and purchasing heads with the hope that the high quality of COLUMBIA products and the dependability of COLUMBIA service will be remembered through the year and years that lie ahead.

We shall be glad to send you free of charge a large size reproduction of above illustration, "The Skeet Shooter" suitable for framing, if requested on business letterhead and naming magazine in which you saw this advertisement.

COLUMBIA

SODA ASH • CAUSTIC SODA • SODIUM BICARBONATE • • •
MODIFIED SODAS • LIQUID CHLORINE • CALCIUM CHLORIDE

THE COLUMBIA ALKALI CORPORATION
EXECUTIVE SALES OFFICES: 30 ROCKEFELLER PLAZA, NEW YORK, N. Y.
Plant: Barberton, Ohio
CHICAGO . BOSTON . ST. LOUIS . PITTSBURGH . CINCINNATI . CLEVELAND . MINNEAPOLIS . PHILADELPHIA



These are times of increased tempo in production—times that call for effective materials and processes—times that provide the chemical industry with a welcome aid, Standard Silicates.

● For use in textile finishing, metal cleaning, water-treating, soap-making, corrugated box manufacture, concrete-hardening, etc., these silicates are ideal.

● Standard Silicates cover a wide range of diversity. Varied physical and chemical properties adapt them to an ever-increasing number of industrial processes, and new uses are constantly being discovered for Standard Metasilicate, Orthosilicate and Liquid Silicates.

● It may be that one of these Standard Silicates is the answer to *your* problem of speeding production, improving product quality or effecting greater economies!

C-5

DIAMOND ALKALI COMPANY
Standard Silicate Division
General Offices · PITTSBURGH, PA.
Plants at Cincinnati · Jersey City · Lockport, N. Y. · Marseilles, Ill.

Not Only Corrosion-resistant to Cut Maintenance Expense . . .

This G-E high-voltage oil-immersed motor controller

ALSO *protects against—*

1. SHORT CIRCUITS
2. MOTOR OVERLOADS
3. UNDERVOLTAGE

HERE'S a G-E high-interrupting-capacity controller which constantly stresses protection for you. It can interrupt a three-phase short circuit of 50,000 kva, and it doesn't require additional fault-current protection for itself or the motor it controls.

Its isothermic induction temperature overload relays protect your motor against damage from operating overloads. The magnetic time-delay undervoltage trip prevents unnecessary shut-downs and unexpected restarting after a power failure.

All connections, terminals, and arcing parts are totally oil-immersed to resist corrosion. Special forms are available for installation in hazardous gas locations. And as you see in the picture above, all parts are enclosed in a strong, welded, steel case.

For more complete information about this oil-immersed controller, just write for publication, GEA-3016, or get in touch with the nearest G-E representative. General Electric, Schenectady, N. Y.

FEATURES
of this CR7006-C4 controller

1. Isothermic overload relays and instantaneous overcurrent trips supplied from current transformers to avoid damage on high overcurrents.
2. Latched-in contactor with double-break, butt-type contacts in arcing chamber. Oil-blast action assures fast arc interruption.
3. Closing solenoid actuated by magnetic-time-delay relay that assures positive latching of contactor.
4. No solenoid holding current required for latched-in contactor.
5. Self-contained control-circuit transformer supplies power for all voltage-operated auxiliary devices.
6. Available in the tank-lowering arrangement as well as in the illustrated lift-out-of-tank construction.

GENERAL ELECTRIC

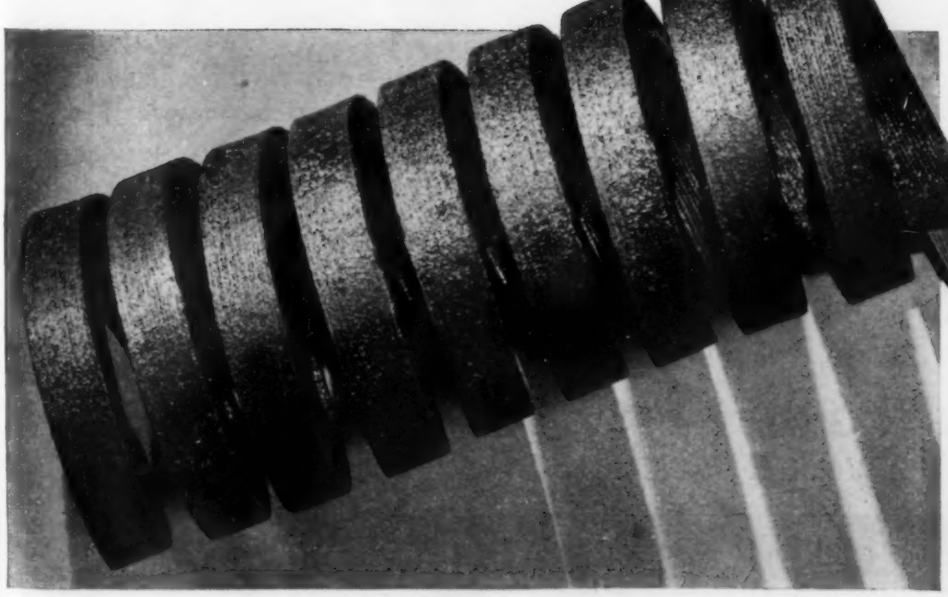
Star!

AS much of a star in its field as the high scoring basketball player is in his, GARLOCK 777 Rubber and Duck Spiral Packing gives outstanding service against hot or cold water and low pressure steam. If formed rings are desired specify GARLOCK 333.

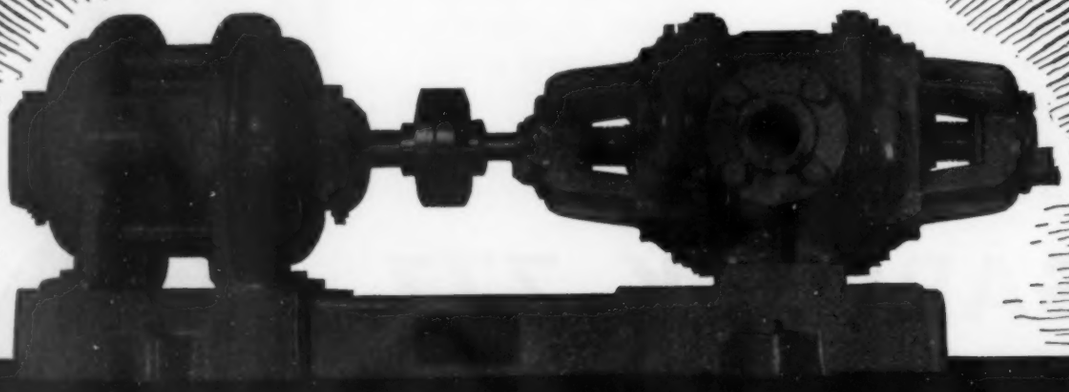
THE GARLOCK PACKING CO., PALMYRA, N. Y.

In Canada: The Garlock Packing Co. of Canada Ltd., Montreal, Que.

GARLOCK 777



CLEAN COMPRESSED AIR



Nash Air Compressors furnish clean compressed air, free from dust, heat or oil. Nash Compressors perfectly meet the need of the Food and Chemical Industries for clean compressed air for agitating, blending, moving liquids by pressure displacement, and for maintaining pressure on storage tanks.

Nash Compressors furnish clean air without supplementary filters or air washers. They are available in any capacity. Simple, efficient, and economical. One moving part, rotating on ball bearings. No internal wearing parts in metallic contact, and no internal lubrication. Ask for Bulletin D-236.

NASH ENGINEERING COMPANY
SOUTH NORWALK, CONNECTICUT, U. S. A.

QUESTIONS

Does your sampler take the whole of the stream part of the time ?

Are equal percentages taken from all parts of the stream being sampled ?

Is the time interval between sampling cuts constant and equal at all times ?

Can cuts be made as frequently as desired and time interval changed at operator's will ?

Does your sampler operate at a MINIMUM COST, with the MINIMUM OF OPERATING ATTENTION, over a LONG PERIOD OF TIME ?

ANSWERS!

The correct answers to these questions are incorporated in the GEARY-JENNINGS SAMPLER.

Whether you are sampling wet or dry material, the construction of the GEARY-JENNINGS SAMPLER, with any one of its three standard cutters, insures the taking of all of the stream part of the time. The cutters travel at a uniform rate of speed, traveling completely across and out of the stream at each cut, taking equal percentages from all parts of the stream.

Geary-Jennings Sampler showing Type "A" cutter.

Sampling cuts are timed by an electric timing switch and the time intervals between cuts are equal within a fraction of a second. Timing switches are furnished to suit any sampling interval wanted and are adjustable for intervals from one to thirty-six minutes.

Notice these other economical features of the GEARY-JENNINGS SAMPLER: Lubrication is required not more frequently than once every two or three months—A dust-proof, moisture-proof housing encloses the entire machine—The Sampler is ruggedly built; there is nothing to wear out—Headroom and space requirements are small—The machine is very easily installed; it is self-contained and requires no belts or pulleys.

The GEARY-JENNINGS Sampler is indeed built to give service at a MINIMUM COST with the MINIMUM OF OPERATING ATTENTION, over a LONG PERIOD OF TIME.

Let us apply this sampler to your sampling problem. Your request for further information will receive immediate attention. WRITE TODAY. Ask for Bulletin No. 361.

THE HOUSE OF GALIGHER thanks its friends for the very pleasant business relations enjoyed during the past year and extends heartiest wishes for a VERY MERRY CHRISTMAS and a MOST PROSPEROUS 1940.

There is no substitute for EXPERIENCE and SERVICE

METALLURGICAL LABORATORIES

Salt Lake City, Utah — Johannesburg, South Africa

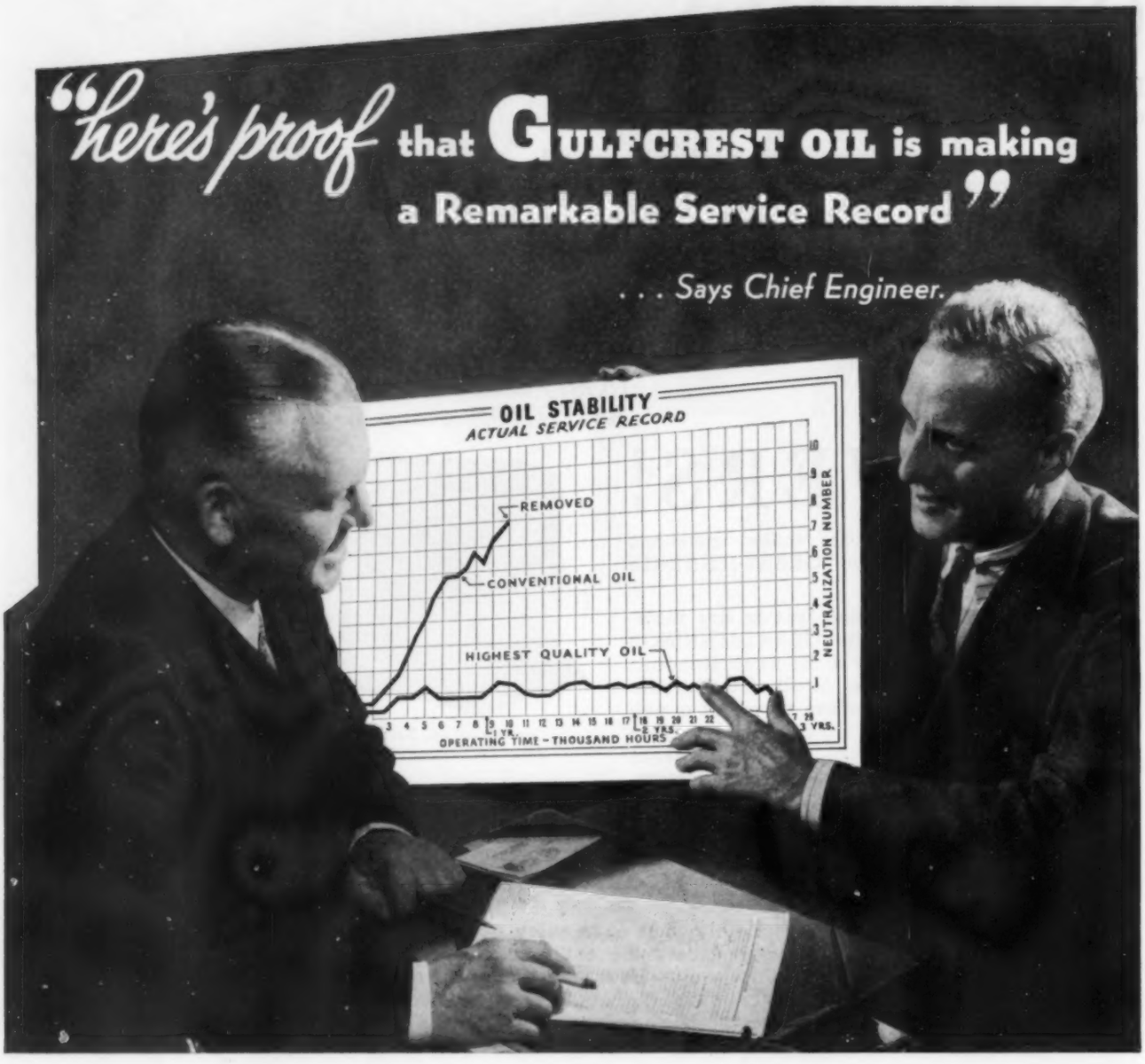
Sole Agents for South Africa, British Mining Supply Company, Ltd., Johannesburg, South Africa

BOOTH-THOMPSON DIVISION ENGINEERING SERVICE

THE GALIGHER COMPANY

228 SO. W. TEMPLE ST. (Established 1901) SALT LAKE CITY, UTAH

BOOTH-THOMPSON DIVISION



. . . Service Records prove *GREATER STABILITY* of this Quality Turbine Oil

OPERATING data covering the performance of Gulfcrest Oil in major turbine installations throughout the country are verifying daily the fact that this improved type of turbine lubricant possesses remarkable stability. After years of service, Gulfcrest shows so little evidence of deterioration that operators find it is in as good condition as when first put into the system.

Gulfcrest is an *entirely different kind* of turbine oil—for this reason: It has been refined not only by conventional processes, but by Gulf's Alchlor process, an advanced method developed by Gulf refinery technologists for removing undersirable hydrocarbons and other impurities which cause oxidation and sludge formation. As a result of this extra purifying process, Gulfcrest Oil possesses a higher degree of stability than any turbine lubricant of which we have record.

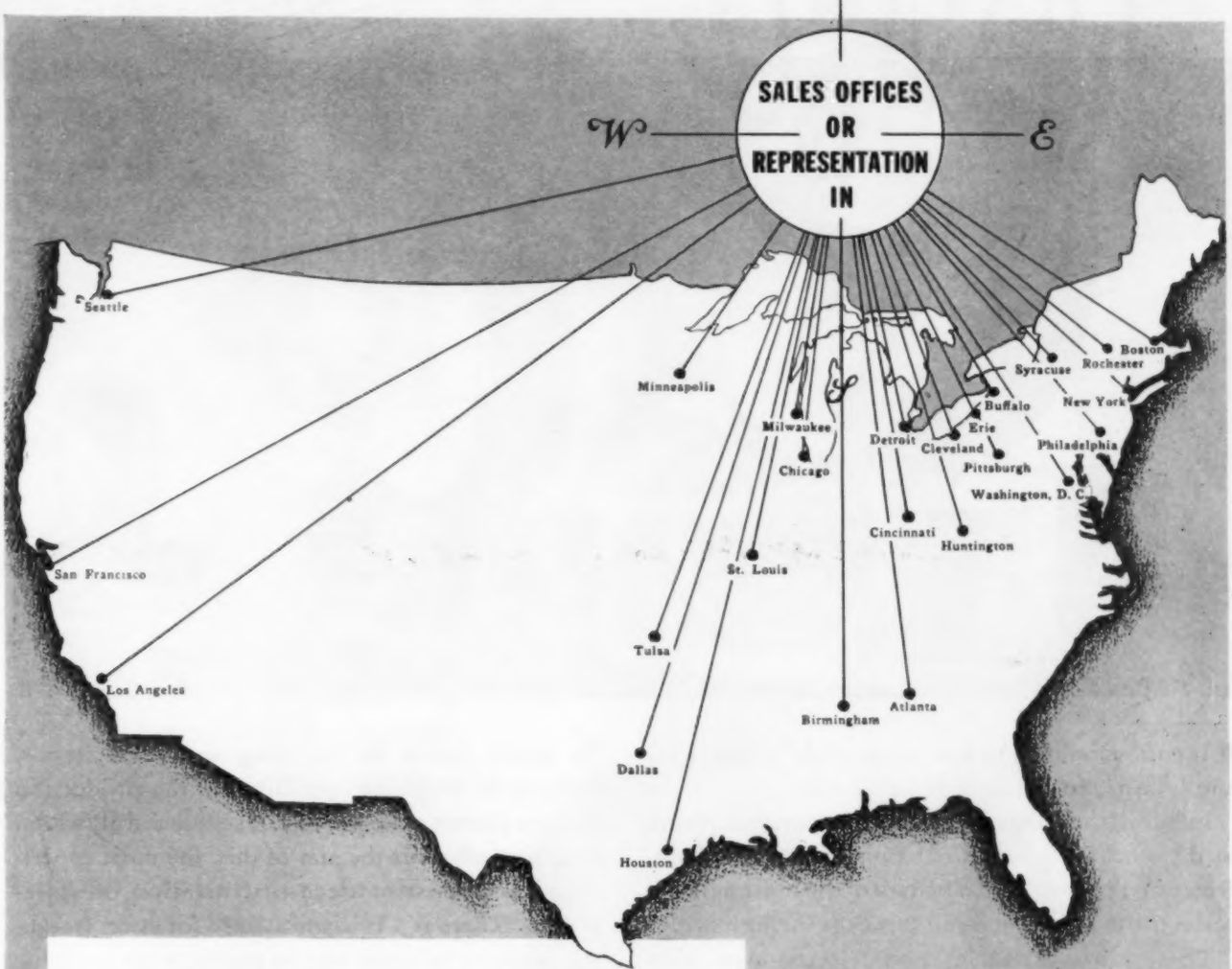
We suggest that you talk with the Gulf engineer about this remarkable turbine oil at your first opportunity. He will be pleased to give you complete details—and you will be under no obligation . . . Gulf Oil Corporation—Gulf Refining Company, Gulf Building, Pittsburgh, Pa.

GULF INDUSTRIAL LUBRICATION

EASY ACCESS TO A DEPENDABLE SOURCE OF SUPPLY

TIMKEN

ALLOY AND CARBON STEEL SEAMLESS TUBES



TUBES FOR

* Boilers and Superheaters
* Cracking Stills
* Locomotives
* Condensers
* Heat Exchangers
* Evaporators
* Bearing Tubing
* Air Conditioning
* Refrigerating
* Automotive
* Pipe Size Use
* Miscellaneous Applications

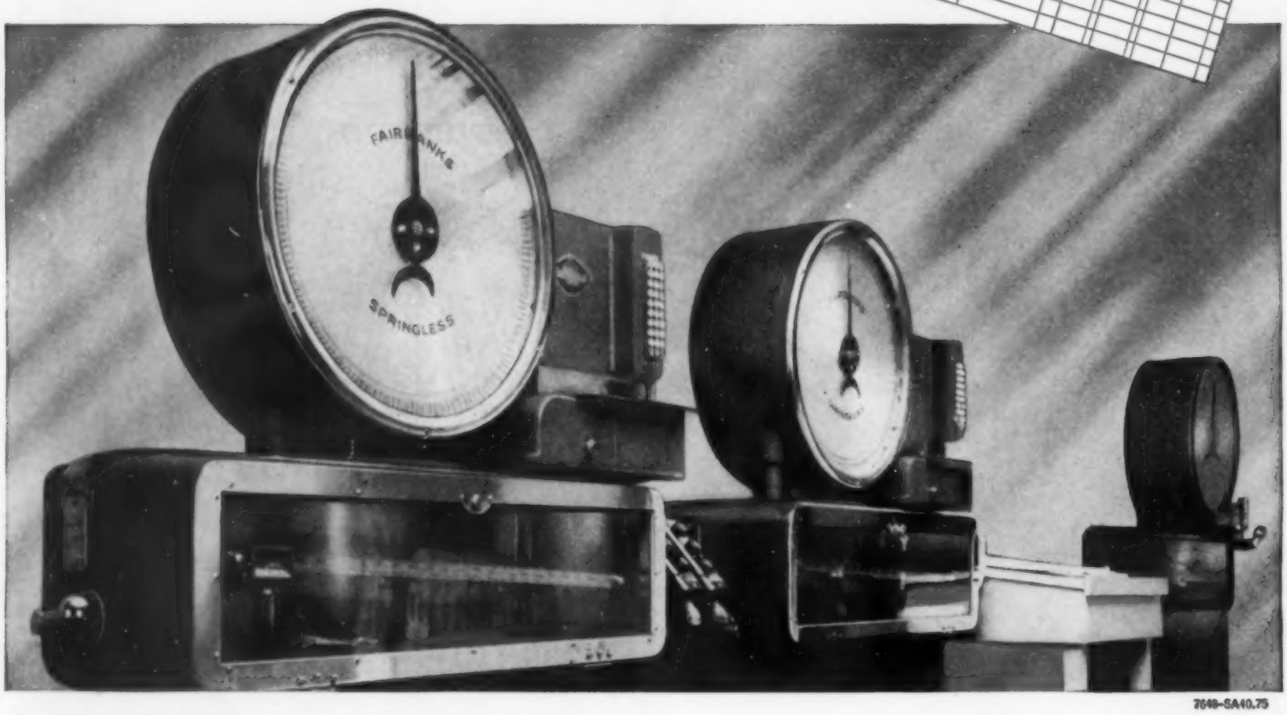
TUBE GRADES

* Carbon Steels
* S. A. E. Alloy Steels
* Intermediate Alloy Steels for resisting normal temperature corrosion and corrosion fatigue.
* Intermediate Alloy Steels for resisting high temperature creep, oxidation and corrosion.
* Stainless Steels

TIMKEN
SEAMLESS STEEL TUBES

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO
Steel and Tube Division

Scales that see ...and keep books!



7049-SA40.75

● It costs money to be inaccurate with "tonnage"—and it costs more money to be s-l-o-w.

In one of the most modern coal preparation plants in the world, Elkhorn Coal Company at Wayland, Kentucky, you will find a battery of the most modern scales in the world handling "tonnage" at high speed.

These Fairbanks Scales with "electric eyes" shut off flow to hoppers automatically when the pre-set weight is obtained. A printed record is made of each operation automatically, and an ingenious keying system enters the tonnage to the credit of the miner who mined it.

To make errors in weighing well-nigh impossible, to fit weighing speedily into the production flow, to protect alike the buyer, seller, and all whom weighing affects is the aim of this, the most experienced and most modern organization of scale-makers. There is a Fairbanks Scale for every weighing need. Its facilities and its products are available at your call.

Fairbanks, Morse & Co., Department 14, 600 South Michigan Avenue, Chicago, Illinois. Branches and service stations throughout the United States and Canada.

FAIRBANKS-MORSE

The Greatest Name in Weighing

SCALES

LARGE OR SMALL

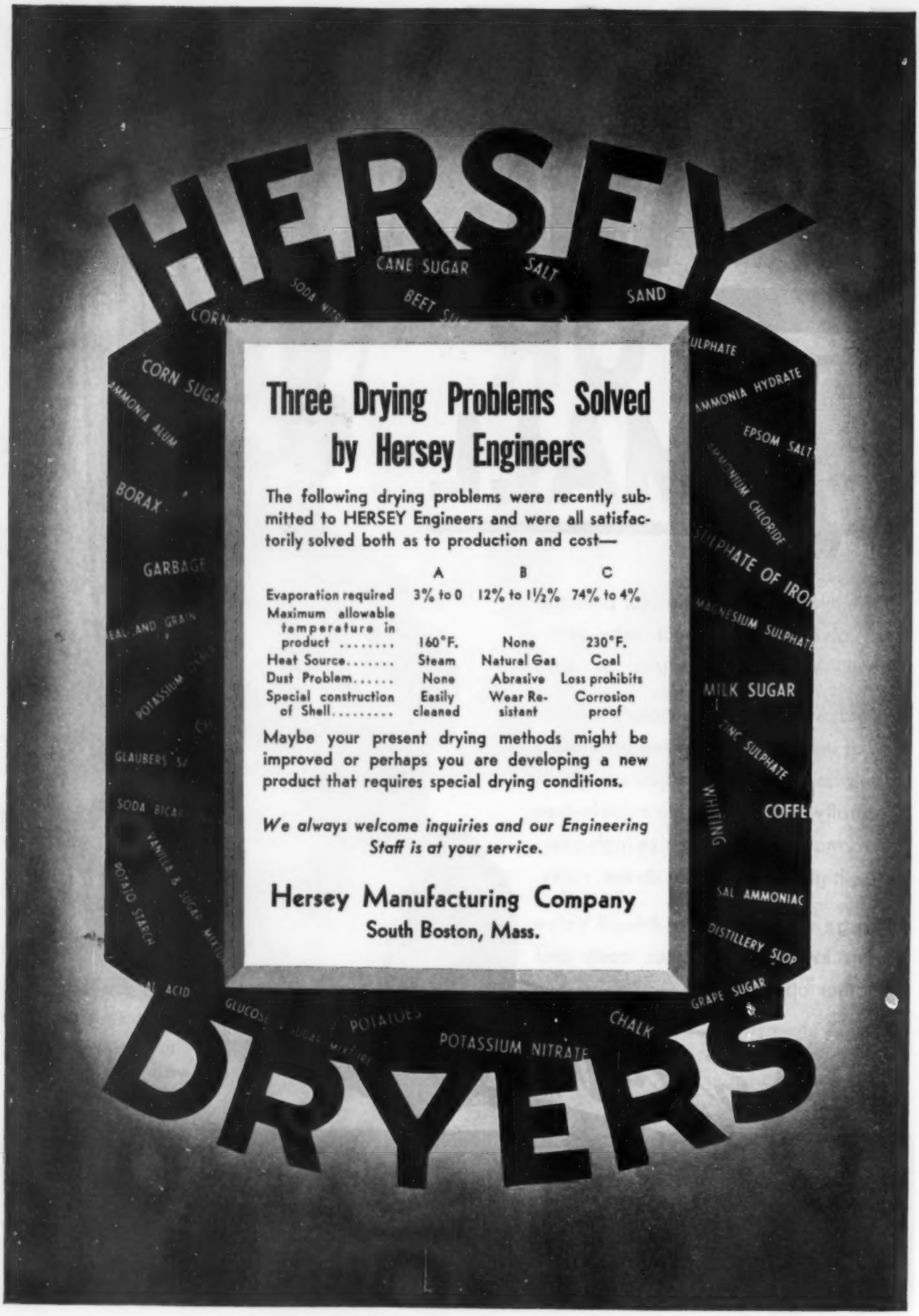
- The inherent properties for prolonging valve life are built into every Powell Valve — regardless of size.
- To Powell, the satisfactory operation of the 1/8" needle valve for closely regulating the flow of liquids or gases is equally important as the trouble-free performance of a large size high-pressure, high-temperature steam valve.
- Large or small—every Powell Valve means lower maintenance costs and smoother operation.

Specify

Write for the Powell Catalogs. Free on request.

POWELL VALVES

THE WM. POWELL CO. CINCINNATI, OHIO



Three Drying Problems Solved by Hersey Engineers

The following drying problems were recently submitted to HERSEY Engineers and were all satisfactorily solved both as to production and cost—

	A	B	C
Evaporation required	3% to 0	12% to 1½%	74% to 4%
Maximum allowable temperature in product	160°F.	None	230°F.
Heat Source.....	Steam	Natural Gas	Coal
Dust Problem.....	None	Abrasive	Loss prohibits
Special construction of Shell.....	Easily cleaned	Wear Resistant	Corrosion proof

Maybe your present drying methods might be improved or perhaps you are developing a new product that requires special drying conditions.

We always welcome inquiries and our Engineering Staff is at your service.

Hersey Manufacturing Company
South Boston, Mass.

THE MAN FROM MISSOURI

BY DOC KEMMETT

A YEAR OR SO AGO an old friend of mine was adding a new extension to his plant. He asked me to come and see him about making some new equipment. One thing he planned to do was to shrink Monel rings onto a large Monel tube. He also wanted to make a number of fancy shaped attachments out of Monel.

"But," he said, "by the time I get through cutting and machining plates, bars, and tubing, you know what I'll have on my hands? A pile of scrap! So the question is . . . how can I avoid it?" I told him the best and easiest way to get the complicated shapes he wanted was to have our Bayonne foundry *cast* them.

I wish you could have seen the withering look he gave me. "How can I do that," he exclaimed, "when what I need is *wrought* Monel. These parts have to be *strong and tough*. I've used Monel long enough to know what I need for a job like this . . . and that's mill forms, *not* castings. Don't give me *that!*"

Well sir, he isn't the only one from Missouri. Lots of engineers I meet refuse to believe that *castings* can be strong and tough. So I just have to *show* them, like I did this fellow.

"Put this in a vise," I said, taking out of my bag a two by six sample of cast Monel, about half an inch thick. "Pound it with a sledge and see if you can break it."

My friend put the sample in a vise, and picked up a fourteen pound hammer. He knew most castings break pretty easily, so he gave this one a gentle tap to start with. Then he hit a little harder . . . and harder yet. After seven or eight heavy blows all he'd done to the cast Monel was bend it thirty or forty degrees.

"Well," I smiled, "it isn't broken yet, but maybe it's cracked at the bend?" He took it out of the vise and examined it. "No," he admitted, "I don't see a sign."

Then I told him something it's time he and other doubting Thomases knew: That INCO's Bayonne foundry turns out Monel castings to minimum strength requirements that *match those of rolled steel bridge plate.*

Monel castings are produced to meet Federal Specification QQ-C-551, which requires minimum properties in *cast* Monel comparable to rolled shapes of structural carbon steel:

Metal	*Specification*	*Minimum Tensile Strength p.s.i.*	*Minimum Yield Point p.s.i.*	*Minimum Elongation % in 2"*
Cast Monel	Fed. Spec. QQ-C-551	65,000	32,500	25
Rolled Steel Plates, Shapes and Bars	ASTM A 7-36	60,000	33,000	22

"As a matter of fact," I added, "you can flatten a centrifugally cast Monel ring till the opposite sides come together." "After what I've just seen, I don't doubt it," he answered, "but tell me: Can I heat such a ring, shrink it onto a tube without it cracking, then machine it to a smooth finsh?"

I told him I'd send a sample ring so he could try it for himself. "And remember," I added as I left, "INCO's Bayonne foundry *specializes* in producing castings in Monel and Nickel. These metals are melted in separate furnaces by clean electric heat, and nothing but virgin stock is used. So you can be sure when you order Monel or Nickel castings the metal is absolutely *pure*...which accounts for its strength and toughness."

After trying the sample ring a week or so later, my friend decided to use Monel castings. That was over a year ago. Today, he's absolutely sold on Monel castings for shapes that are hard to make out of mill forms. Now you'd never know he was once "from Missouri."

DOC KEMMETT

A centrifugal Monel casting, before and after a bend test.

DOC KEMMETT SERVICES

Have *you* a production or equipment difficulty that Doc Kemmett might help you overcome? If so here are the ways in which he may help you:

1 With data on properties and performance of metals.

2 By helping you get better equipment performance or better product quality.

3 By furnishing equipment and samples for measuring corrosion resistance.

4 By furnishing engineering data and information on construction methods for Monel*, Nickel and Inconel*.

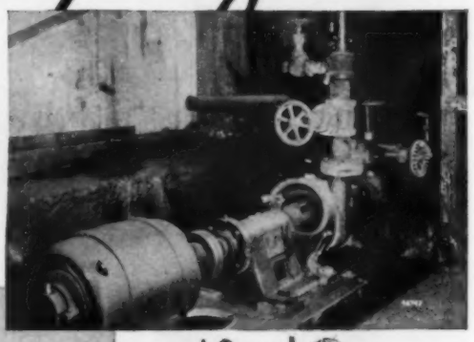
5 By giving instructions on methods of fabricating Monel, Nickel and Inconel.

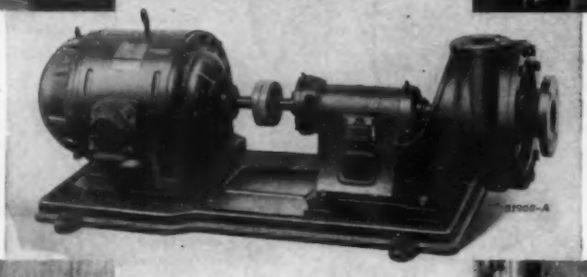
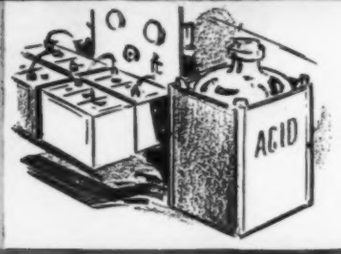
6 By sending you bulletins and other publications of interest.

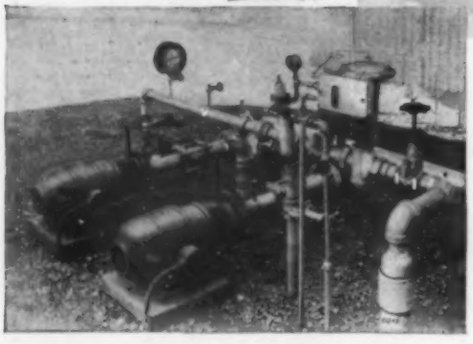
*"Monel" and other trade-marks which have an asterisk associated with them are trade-marks of The International Nickel Company, Inc.

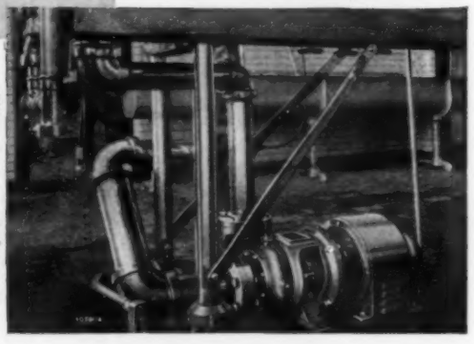
THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York, N. Y.

PUMPS - *for any liquid*







Whether you must pump water, acid solutions, petroleum products, alkali solutions, there is an Ingersoll-Rand pump to fill your needs in an economical and dependable manner.

Ingersoll-Rand engineers and metallurgists have had wide experience in building pumps for handling all types of liquids. Because of this experience Ingersoll-Rand pumps are efficient and require little maintenance.

Ask our engineers about the pumps listed below—one of them may help you reduce your liquid handling costs.

PUMP	PRESSURE RANGE	CAPACITY RANGE
The Motorpump Class TRV, turbine driven pump Class CRV, cradle mounted pump	5 to 225 lbs.	5 to 1500 gpm.
Single-stage, Coupled-Pumps in sizes from 1½ to 24 in.	10 to 130 lbs.	25 to 30,000 gpm.
Class GT, 2-stage pumps	100 to 425 lbs.	100 to 2200 gpm.
Class NT, 4- and 6-stage pumps	100 to 600 lbs.	50 to 600 gpm.

Also other pumps for any pressure and capacity.

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Ingersoll-Rand

Cameron Pump Division

11 BROADWAY, NEW-YORK, N.Y.

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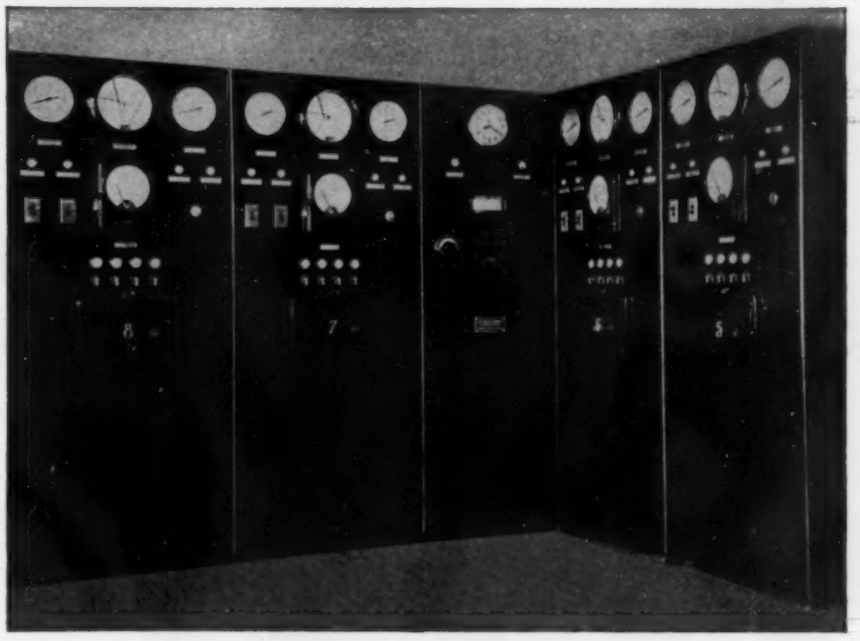
NOW, YOU CAN ELIMINATE your plant's worst menace— "blind spotted" processing



Another feature of BRISTOL'S SYSTEM OF COORDINATED PROCESS CONTROL

that helps you end rejects, cut costs, improve quality

In many plants today, there still lurks the menace of production "blind spots." An intricate or concealed operation here, a critical cycle there—that up to now has eluded your efforts to control it within modern manufacturing tolerances.

It is this situation which Bristol's System of Coordinated Process Control is intended to solve—AND NOW, in an impressive number of plants, is solving successfully.

Coordinated Process Control provides *complete automatic control* of a *whole process.* Every factor such as the operation of valves or motors, every variable such as temperature or pressure, every step in the progress of the process is controlled automatically, from beginning to end. Nothing is left to manual manipulations or to the uncertainties of human judgment.

The resulting economies are nothing short of startling. Yields are increased. Rejects eliminated. Time saved. Costs cut. Product uniformity is a certainty.

To every executive responsible for production, Bristol's System of Coordinated Process Control is likely to prove a revelation. Bulletin No. 460-511 F gives the details. We shall gladly send you a copy.

More Than Just Instruments

Bristol's System of Coordinated Process Control is made possible *only by the combination* of (a) the ability, experience and facilities of the Bristol's engineering staff to apply to a given plant problem a simplified layout of modern instruments providing complete coordinated process automaticity, (b) Bristol's Process Cycle Controller, the "mechanical brain" of coordinated process engineering, and (c) the complete line of Bristol's controlling, recording and indicating instruments for pressure, level, temperature, humidity, flow, motion, electrical quantities, etc., —a complete service backed by Bristol's undivided responsibility.

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WATERBURY, CONNECTICUT

Branch Offices: New York, Boston, Philadelphia, Pittsburgh, Birmingham, Akron, Detroit, Chicago, St. Louis, Los Angeles, San Francisco, Seattle. Canada: The Bristol Company of Canada, Limited, Toronto, Ontario. England: Bristol's Instrument Company, Limited, London, N.W.10

In Wide Use Today

This modern technique of process control is now being used by some of the most progressive and successful manufacturers in this country.

Bristol's System of COORDINATED PROCESS CONTROL

INDUSTRY'S GUIDE TO A UNIFORM PRODUCT

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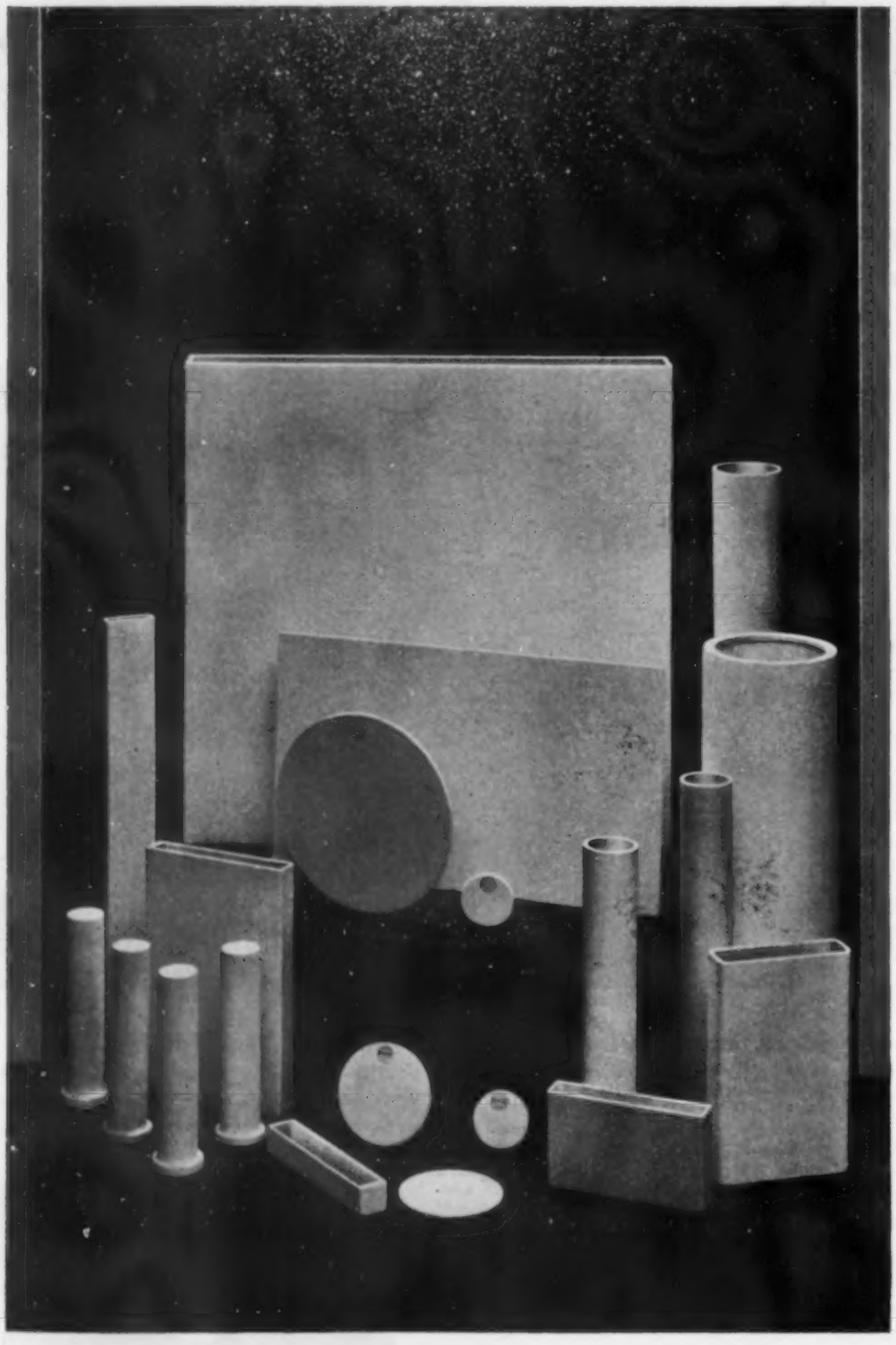

ELECTRO - CHEMICAL processes involving a multitude of conditions are carried on by means of Alundum Porous Mediums.

Combined in these Norton fused alumina products you'll find:

Strength
Stability
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High Porosity
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Alundum Diaphragms are available in a wide range of sizes and shapes and in different porosities and permeabilities to meet the particular requirements of individual plants.

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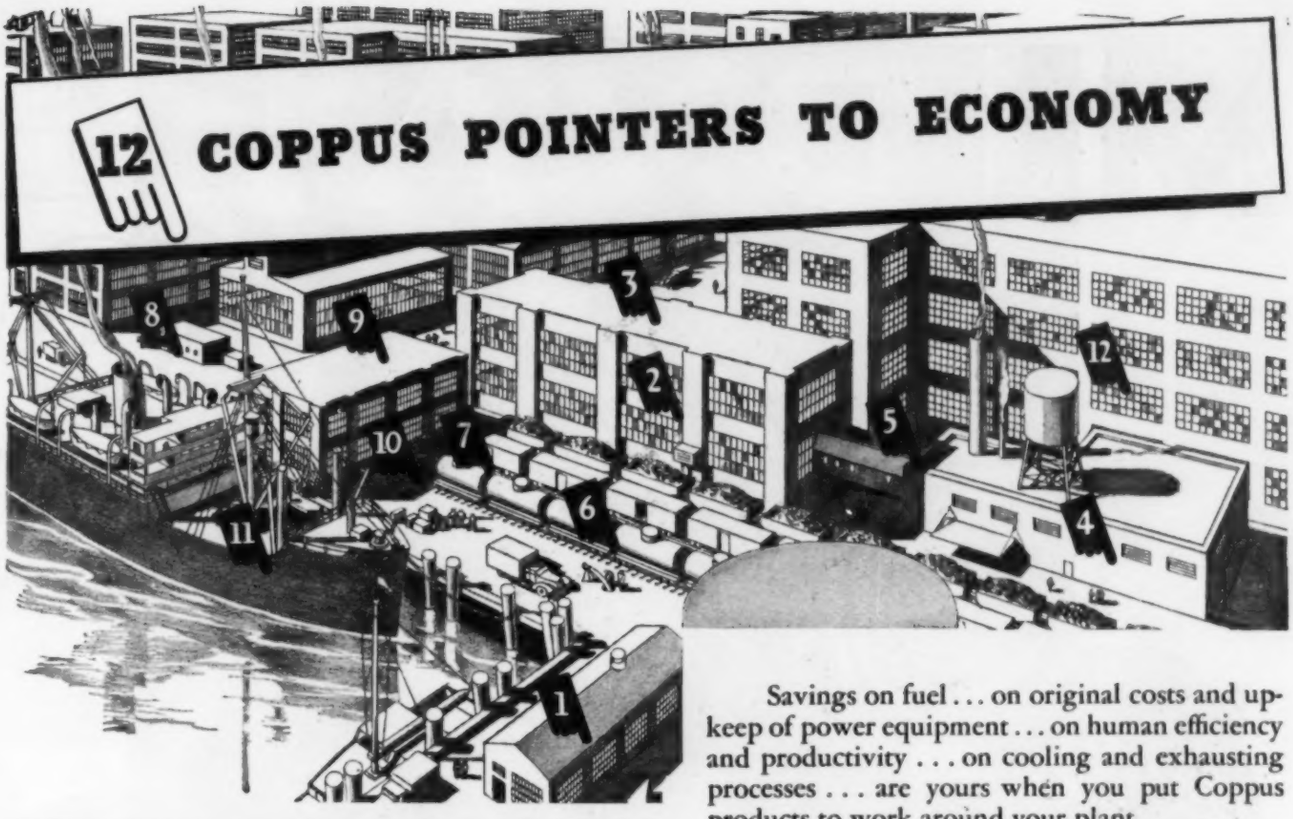
12 COPPUS POINTERS TO ECONOMY

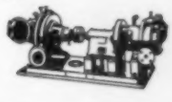


Savings on fuel . . . on original costs and upkeep of power equipment . . . on human efficiency and productivity . . . on cooling and exhausting processes . . . are yours when you put Coppus products to work around your plant.

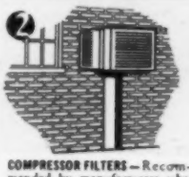
Special new type, higher efficiency, natural gas burners; also all kinds of blowers, fans, ventilators for men and machines; steam turbines of just the size you need for each small job; etc.

Designed in the first place to fit the general needs of your industry, Coppus builds these products particularly to meet *your* conditions.

Send for free bulletins giving full details on the ways *you* could save — noting your special interests among the applications pictured alongside this text.

1 

BLUE-RIBBON STEAM TURBINES—6 sizes up to 150 H.P. Prices in line. Horizontal, vertical, or with built-in speed reducers.

2 

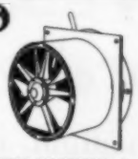
COMPRESSOR FILTERS—Recommended by manufacturers who supply over 90% of the country's compressors and engines.

3

STATIONARY UNIT AIR FILTER—95.6% efficient against 2 micron-size silica dust. Highest U. S. commercial rating.

4

VENTILATOR FILTERS—Combination ventilator-filter unit for laboratories, instrument assembly rooms, etc.

5 

NATURAL GAS BURNERS—Coppus-Dennis Fanmix for industrial applications. Pinwheel action produces perfect gas-air mixture.

6

CABLE MANHOLE VENTILATORS—Fast ventilation of *any* confined space. Electric motor or gasoline engine driven.

7

TANK AND TANK CAR VENTILATORS—Supply clean, cool air to men working. On cars — attachable to nipple if desired.

8

BOILER MANHOLE BLOWERS & EXHAUSTERS—swift cooling and ventilating of boilers, tanks, retorts, etc.

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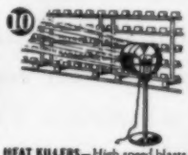
MANCOOLING FANS—Keep production up by keeping men cool. No stale air-recirculation. Air is directed.

10 

HEAT KILLERS—High speed blasts for cooling and drying furnaces, motors, generators, products, etc.

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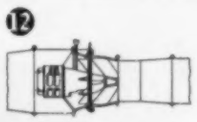
SHIPHOLD VENTILATORS—For exhausting welding fumes and other injurious gases from confined working spaces.

12 

VANO BLOWERS—Fitted to meet any special air problems where ordinary fans fail. They are most efficient.

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355 Park Avenue, Worcester, Mass.

CHECK ✓ NUMBER OF APPLICATIONS

1 ☐	4 ☐	7 ☐	10 ☐
2 ☐	5 ☐	8 ☐	11 ☐
3 ☐	6 ☐	9 ☐	12 ☐

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MIDVALE

PRESSURE VESSELS

of either carbon or alloy steels

This particular cylinder is of chrome, vanadium, molybdenum alloy steel—O. A. L. 40′ 6″, I. D. 37″, walls 5 3/32″ thick and weighed approximately 146,620 lbs.

It was made for the oil industry, but also indicates Midvale's ability to meet special requirements demanded elsewhere in the process industries. From giant seamless vessels to small ones, from tube supports to simple alloy bars, Midvale has met the problems of pressure, of heat and corrosion resistance that face the oil industry and most other process industries.

Midvale would like to help you.

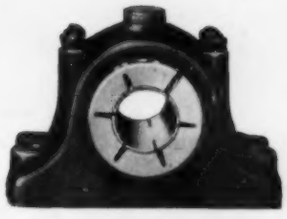
THE MIDVALE COMPANY

NICETOWN, PHILADELPHIA, PA.

OFFICES: *New York • Chicago • Pittsburgh • Washington • Cleveland • San Francisco*

Buried in Dirt

is ALIVE with POWER



There are more than 1800 types and sizes of Dodge Bearings—available for both built-in machine application and for power transmission lines.

DEEP in dirt—literally buried in it—this Dodge-Timken type "C" Pillow Block had to be dug out to be visible—and yet—under such difficult conditions—it has been alive with power operating under heavy loads and at high speeds—with negligible maintenance in a large steel mill for six years. Regardless of assignment—Dodge-Timken Bearings deliver the maximum of horsepower hours. Their ruggedness insures steadier, more continuous production flows with low maintenance—they require no attention except infrequent lubrication. They let power in — and keep abrasive dust out. All Dodge Bearings are completely assembled, factory adjusted — pre-lubricated units — delivered ready to install — Specify Dodge.

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MISHAWAKA, INDIANA, U. S. A.

THE Right Drive FOR EVERY JOB

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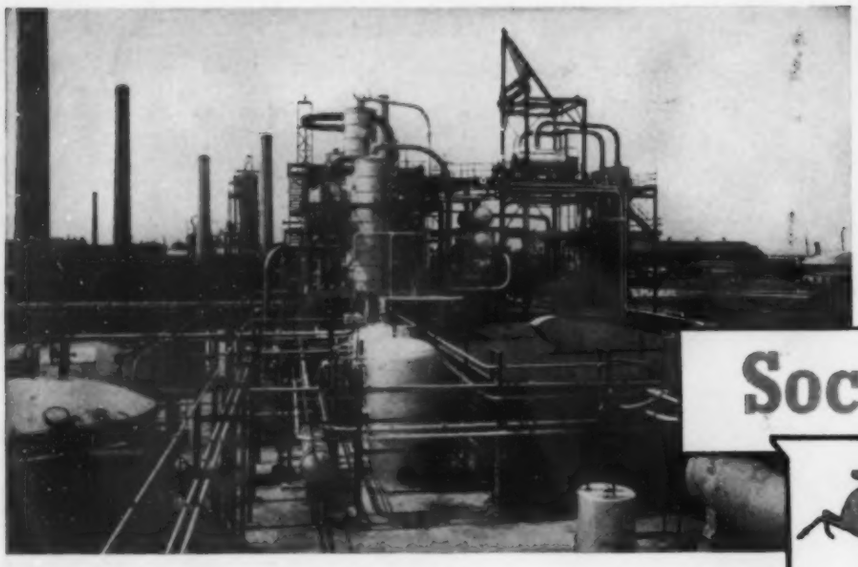
. . . when planning a new plant . . . when adding a new department . . . when installing new machinery . . . when modernizing old equipment . . . when designing new products.



SOCONY-VACUUM

SOCONY-VACUUM

K & M insulation helps to produce these famous lubricants

For high efficiency insulation of the towers of this dewaxing plant, the Socony-Vacuum Oil Company, Inc., confidently selected K & M "Featherweight" 85% Magnesia, one of the most efficient forms of insulation ever developed for temperatures up to 600° F.

The material was supplied by the Armstrong Cork Company, Keasbey & Mattison Distributor with headquarters in Philadelphia and Baltimore, whose service includes not only the supplying of quality insulation materials, but their correct application in a customer's plant. Armstrong has found that K & M insulation does its full part in building good will and clinching Armstrong's position in this highly technical field.

K & M

Keasbey & Mattison engineers, working with K & M Distributors strategically located throughout the country, can point the way to real savings in your plant, too. Why not write Dept. 11 for further details?

"FEATHERWEIGHT" 85% MAGNESIA

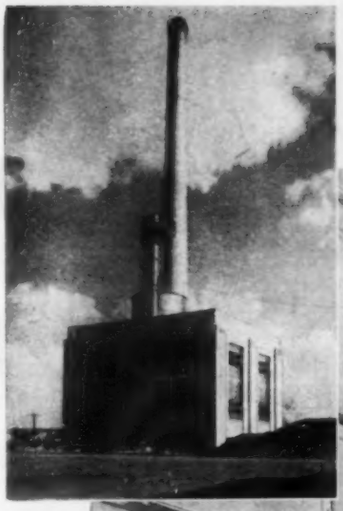
"The Time-Proven Insulation"

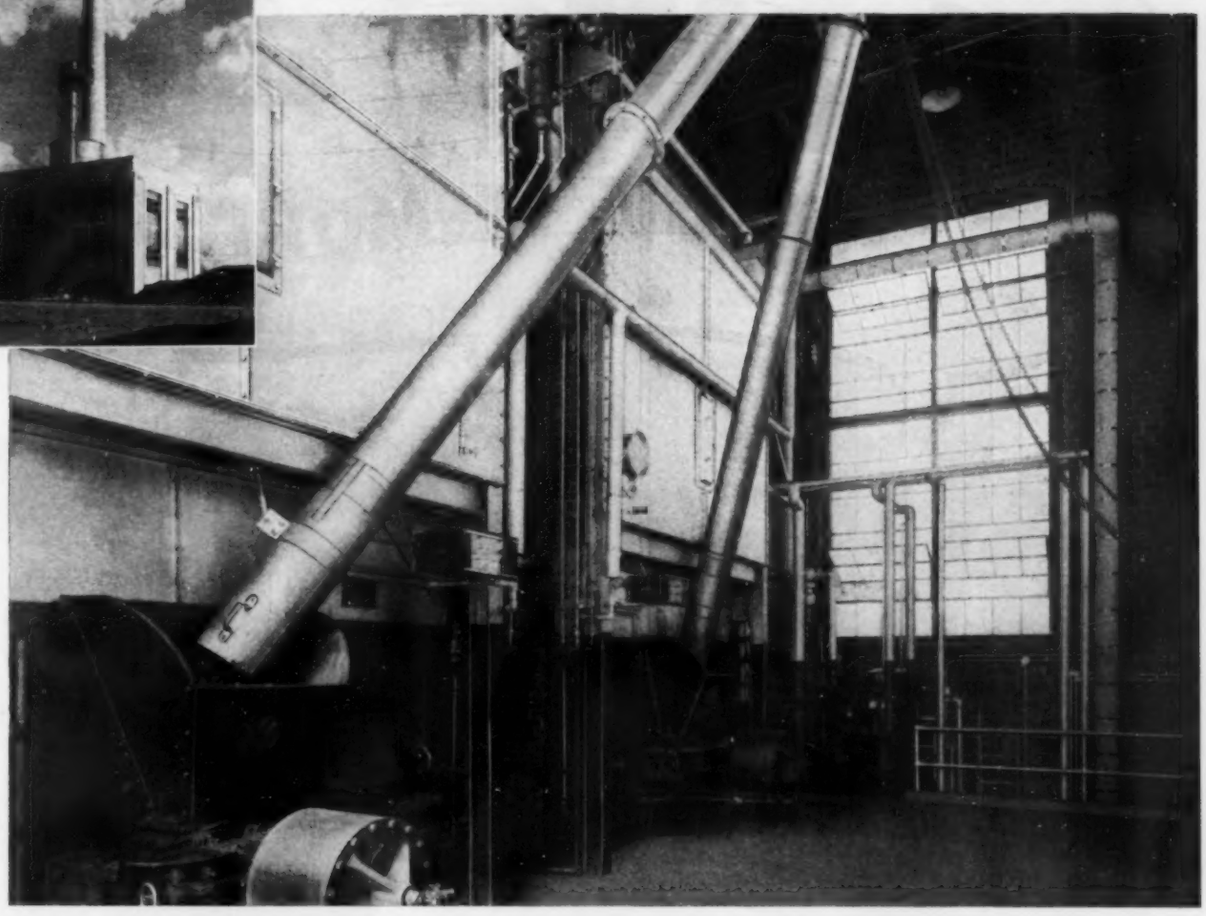
KEASBEY & MATTISON

COMPANY, AMBLER, PENNSYLVANIA

The exceptional efficiency, durability and physical properties of Keasbey & Mattison Asbestos and Magnesia insulations make them especially valuable for energy conservation in the process industries. They are the result of more than half a century of experience in the development of specialized insulation materials. The K & M line is complete, and priced right. Distributors' warehouses are strategically located throughout the country for quick service.

STICKING WITH THE JOB





at The GUMMED PRODUCTS COMPANY

BENT TUBE
SECTIONAL
HEADER AND
BOX HEADER
BOILERS

Troy, Ohio, is the home of The Gummed Products Company, makers of Trojan and Sterling brands of high quality cloth and paper sealing tapes, and a complete line of gummed papers for labels, stickers and seals.

Two 350 horsepower Vogt boilers meet all the steam requirements of this modern plant. Steam production costs are maintained at a pleasingly low level, as revealed by a report received recently, and our customer expresses complete satisfaction with the performance of these units.

Vogt Boilers will do as much for your plant!

Vogt

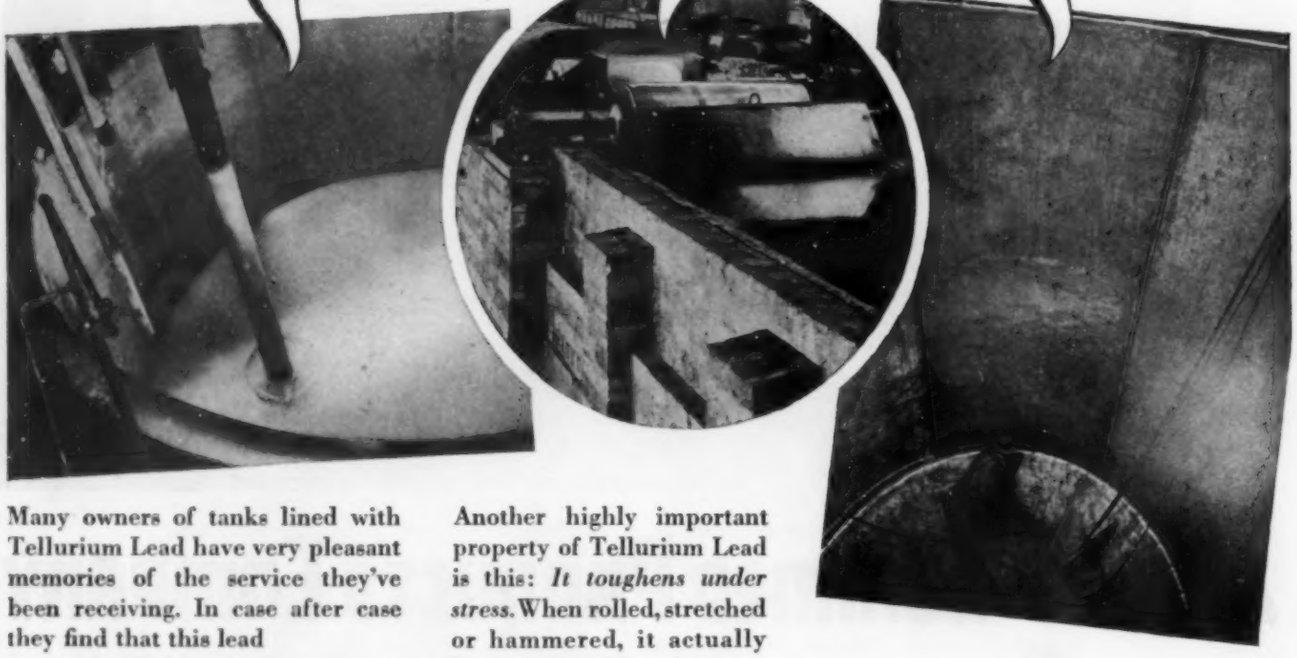
HENRY VOGT MACHINE CO.

LOUISVILLE, KENTUCKY

NEW YORK, PHILADELPHIA, CLEVELAND, CHICAGO, DALLAS

WATER TUBE BOILERS

TANKS FOR THE MEMORIES



Many owners of tanks lined with Tellurium Lead have very pleasant memories of the service they've been receiving. In case after case they find that this lead

- gives improved resistance to corrosive acids.
- lasts longer under conditions of extreme difficulty.
- reduces shut-downs for repairs.

These reports come from many different types of plants—and from a wide variety of industries. Again and again, the story is the same. Tellurium Lead has handled sulphuric and other corrosive acids even at temperatures that approach the melting point of the metal—and has managed the job more successfully than it has ever been done before.

Another highly important property of Tellurium Lead is this: *It toughens under stress.* When rolled, stretched or hammered, it actually becomes stronger. As a result, turnover points and joints are less subject to cracking. Furthermore, where vibration occurs, this capacity to develop latent strength minimizes buckling and creeping. It also means improved resistance to fracture due to repeated heat changes.

Tellurium Lead of our manufacture is time-tested St. Joe chemical lead alloyed with a small quantity of tellurium. It gives the advantages of this well-known chemical lead plus important new ones. Yet now it costs only a fraction of a cent more per pound than chemical lead. In sheets, pipe and coils. For further facts, write our nearest branch.

Typical User Reports

"We lined one of our tubs with your Tellurium sheet lead. After eight months, the lining shows very little if any corrosion due to the action of the 10% boiling sulphuric acid. It promises to have a much longer useful life than the lead previously used."

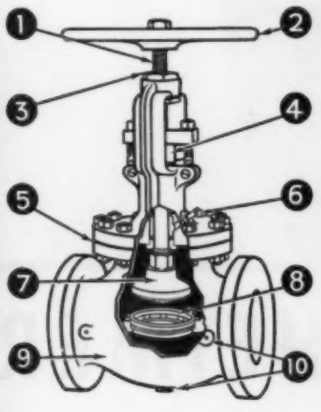
"We have been using Tellurium Lead in steam injector pipes for acid service," another user reports. "We find that the material has a distinct advantage over lead formerly used. It gives the added rigidity and resistance to deformation needed under the conditions present."

TELLURIUM LEAD

NATIONAL LEAD COMPANY
New York, Baltimore, Buffalo, Chicago, Cleveland, Cincinnati, St. Louis; National - Boston Lead Co., Boston; John T. Lewis & Bros. Co., Philadelphia; National Lead & Oil Co., Pittsburgh; Georgia Lead Works, Atlanta; American Lead Corp., Indianapolis; Master Metals, Inc., Cleveland; The Canada Metal Co., Ltd., Toronto, Montreal, Winnipeg, Vancouver.

JENKINS steel GLOBES

with service-proved construction at these 10 vital points



1—Liberally-Threaded, Stainless Steel Spindle*
2—Firm-Grip, Hand Wheel
3—Full Length, Bronze Yoke Nut
4—Husky, Nickel Alloy Packing Gland
5—Long-Life, Asbestos Gasket†
6—Handy, Cooling Chamber Plug
7—Bevel-Faced, Stainless Steel Disc*
8—Renewable, Stainless Steel Seat Ring*
9—Husky, Cast Carbon Steel Body‡
10—Five Convenient Bosses

†Corrugated Steel Gasket on Series 40 and 60.
**Trim also available in bronze, monel or steel.*
‡Body, Bonnet and Yoke also available in chrome molybdenum steel.

JENKINS Cast Steel Gate, Globe and Swing Check and Automatic Equalizing Stop and Check Valves are made in Series 15, 30, 40 and 60. Get complete details from your local distributor or direct from Jenkins Engineering Advisory Service.

JENKINS BROS., 80 White St., New York, N.Y.; Bridgeport, Conn.; Boston; Chicago; Philadelphia; Atlanta; Houston. JENKINS BROS., Ltd., Montreal; London, Eng.

FIG. 1042, Series 30, Carbon Steel Globe Valve, Stainless Steel trim, for 300 lbs. steam, maximum temperature 750°F.— 600 lbs. non-shock Oil, Water, Gas at 100°F.

BUILT TO JENKINS TOP-QUALITY STANDARDS

1864 JENKINS TRADE MARK 1939

Jenkins Bros.

DIAMOND ANNIVERSARY

Fig. 2129
Single Wedge Disc
Non-rising Stem

Fig. 2125
Double Wedge Disc
Rising Stem

LUNKENHEIMER
125 lb. S.P.
BRONZE GATE VALVES

These two valves offer more economical and satisfactory service on the numerous low-pressure applications around industrial plants.

Their advanced design provides unusual strength and ruggedness -- machining is to close tolerances -- materials exceed accepted standards. We invite direct comparison with any 125 lb. S.P. bronze gate valve you may now be using.

On your next order for 125 lb. S.P. bronze gate valves, specify Fig. 2125 for the Double Wedge Disc, Rising Stem type or Fig. 2129 for the Single Wedge Disc, Non-rising Stem type. You will profit from the excellent service you will get from these fine valves.

For detailed design and construction features write for circular 544.

ESTABLISHED 1862
THE LUNKENHEIMER CO.
"QUALITY"
CINCINNATI, OHIO, U. S. A.
NEW YORK CHICAGO
BOSTON PHILADELPHIA
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THREE MORE 100 OCTANE PLANTS

BY LUMMUS

For well-known refiners, Lummus is now designing and building three complete plants for the production of aviation gasoline. These will be the third, fourth, and fifth Lummus plants for 100 octane fuel.

The rapid growth of commercial aviation and other recent developments indicate an increasing demand for 100 octane gasoline. With their experience in designing and building plants of this type, Lummus Engineers are particularly qualified to discuss the design, efficiency and money-making possibilities of aviation gasoline units.

THE LUMMUS COMPANY, 420 Lexington Avenue, NEW YORK, N. Y.

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LUMMUS

PETROLEUM REFINING PLANTS AND CHEMICAL DISTILLATION EQUIPMENT

"YOU don't seem to realize," said the president steadily, "that with material and labor costs—and taxes—so greatly increased, we can't spend . . ."

"Unless we do spend," the production executive interrupted, "to modernize and cut operating cost, you'd better order another carload of red ink."

"Just what do you suggest?"

"I suggest that we get a man in here to make a free survey of our plant and show us exactly where and how we can cut our operating costs and reduce waste."

The free survey was made. As a result of it, Taylor Automatic Controls were installed throughout the plant. Shortly the company was in the black . . . operating costs had been reduced by more than one-third.

* * *

THIS STORY is typical of the way Taylor is helping industry to overcome the problems of today—the problems of higher taxes, of increased material and labor costs. For Taylor shows you how to attack the one cost which you can reduce—operating cost.

Taylor Automatic Controls can insure the uniformity of your product... can reduce spoilage and speed production. This means more sales and greater profits for you.

Write today for a Taylor man to make a free survey of your plant. No obligation, of course. Taylor Instrument Companies, Rochester, N. Y. Plant also in Toronto, Canada. Manufacturers in Great Britain: Short & Mason, Ltd., London, England.

Taylor

Indicating Recording • Controlling

TEMPERATURE, PRESSURE, FLOW *and* LEVEL INSTRUMENTS

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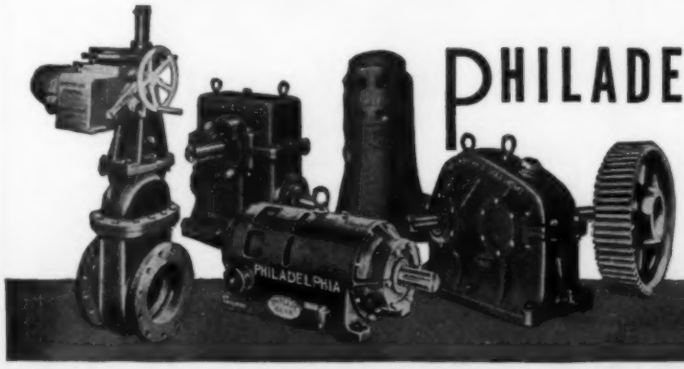
MOTOREDUCER

PREFERRED

for UNFAILING PERFORMANCE

Vertical MotoReduceR installed on Mixing Tank in large chemical plant.

Because the Philadelphia MotoReduceR has proven over a number of years to be a highly economical, efficient and trouble free drive it continues to be preferred by countless chemical and allied plants. It's built in both horizontal and vertical types with motor, combined with a planetary speed reducer in a streamlined, sturdy housing . . . adaptable for driving almost any equipment. The vertical type is especially suited for operating agitators, mixers and similar chemical plant service. Write us today . . . we'll tell you how to get more value with less trouble for your power dollar.



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PHILADELPHIA GEAR WORKS
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INDUSTRIAL GEARS • SPEED REDUCERS • MOTOREDUCERS • LIMITORQUE CONTROL

NOW—You Can Control Proportioning in Chemist Room with the Units Located Elsewhere in the Plant . . . . . .

Believe it or Not . . the Chemist can now sit at his desk and control the proportioning of two or more materials out in the plant where the units are operating. The operator can only regulate the tonnage rate.

All this is made possible by the use of Jeffrey-Traylor Waytrol feeders equipped with Selsyn driving motors. These are shown in the illustration—two Waytrols, the control panel and the Selsyn units direct connected to variable speed drives.

Waytrols may be arranged to follow the demand curves of grinding units, elevators, etc. Only Jeffrey can supply this unique proportioning control. Let us tell you more about it.

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Jeffrey also builds electric vibrating pan and tubular feeders, screens, conveyors, dryers, coolers and barrel packers. Write for Catalog No. 650-G.

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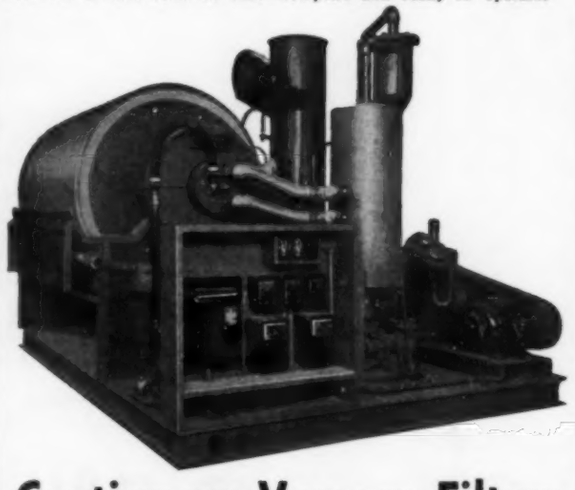
Eimco Sewage Sludge-Filter with lime and ferric-chloride feeders, sludge mix-tank, vacuum-pump and receiver system, etc., all mounted on one common base—complete and ready to operate.



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We manufacture both drum and disc filters in a wide variety of modern types and sizes up to 1800 sq. ft. of filtering surface. Either drum or disc-type filters can be supplied (in sizes up to 65 sq. ft. of filtering area) with all accessory equipment, including piping and electrical panel, mounted on one common base—complete and ready to operate. Ideal for test units or other small requirements. Details promptly on request.

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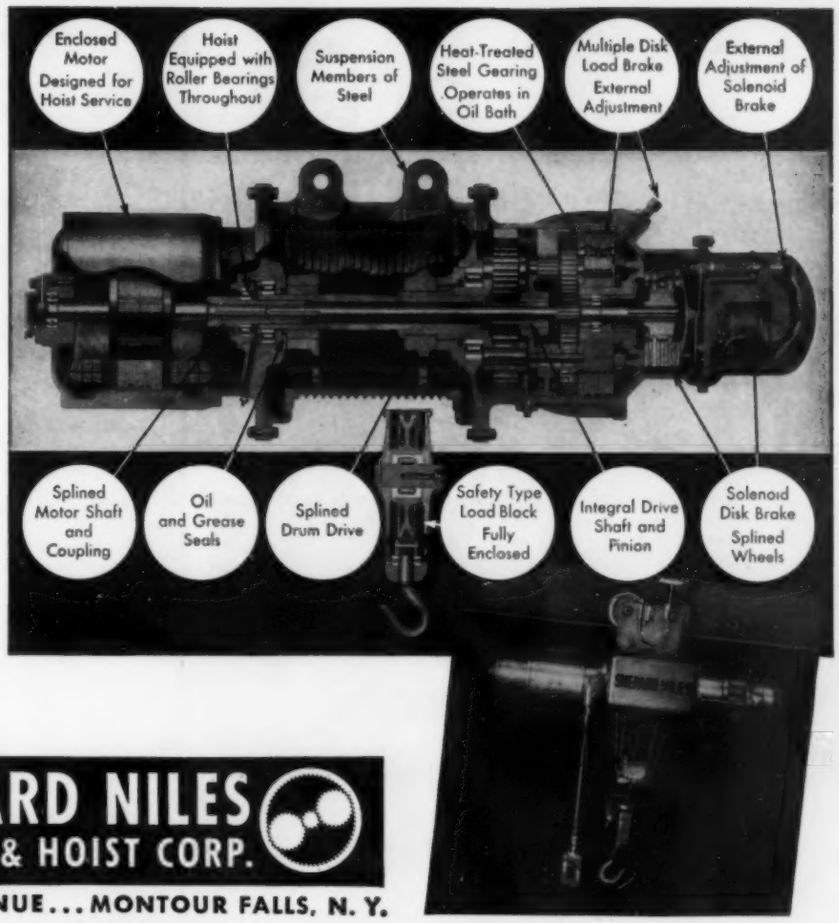
CAPACITIES ONE-EIGHTH TO TWENTY TONS

● After thousands of lifts and years of service the perfectly balanced hoisting mechanism of the LiftAbout functions smoothly in its bath of oil. Complete enclosures seal all vital parts against dust, dirt and moisture.

It is available in a wide range of types and sizes. For typical applications and more complete information write for Bulletin No. 126.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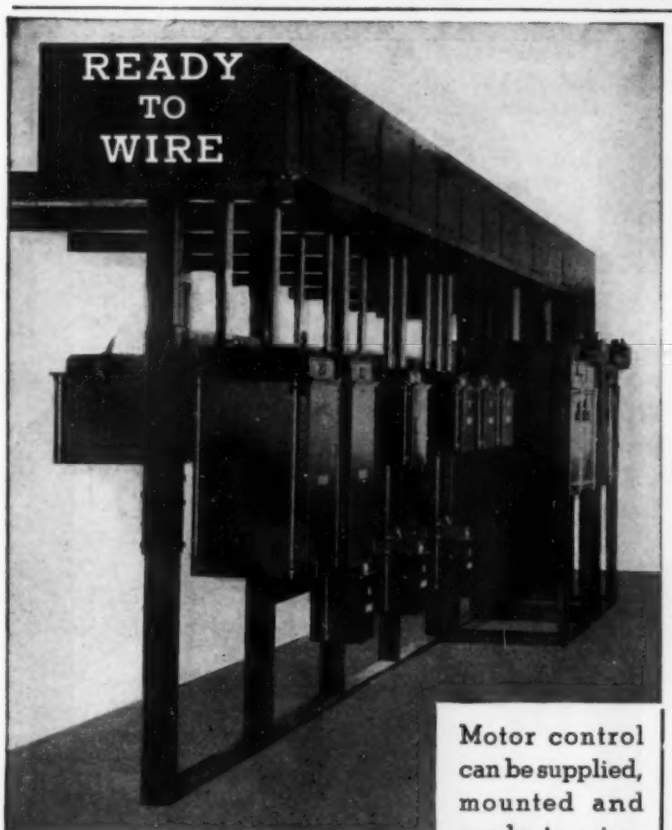

Motor control can be supplied, mounted and ready to wire. Send us your specifications.

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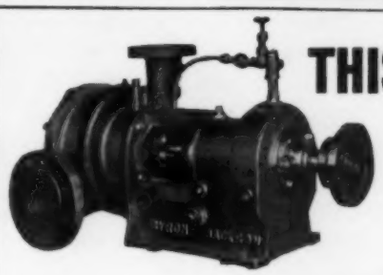

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are built to absorb the wear and tear of extra-severe service where ordinary water pumps won't hold up. They are especially recommended for difficult pumping service where hot or cold liquids or fluids carrying abrasives are encountered. Byron Jackson Process Pumps are of horizontal, single stage, single suction, heavy duty design, with vertically split case. Case and impellers may be made of cast iron, Meehanite, Nireist, carbon, or alloy steel or almost any alloy best suited to your particular requirements.

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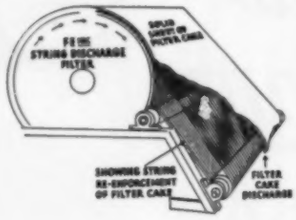
Chicago, Illinois — Kansas City, Missouri

HIGH CALCIUM

MARBLEHEAD CHEMICAL LIME



When You BUY

a FEinc String Discharge Filter or CONVERT your present filter to a FEinc Strong Discharge unit you immediately find a saving of up to 40% in the cost of filter cloth.

Other advantages are explained in our latest booklet: "How and Why FEinc String Discharge Filters Slash Filtration Costs." Send for your copy now.

See page 382 in the Chemical Catalog, 1939 issue

FILTRATION ENGINEERS, INC.

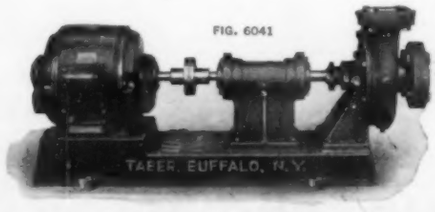
585 Summer Ave. Newark, N. J.

NEW YORK — CHICAGO

DISCOVER

this general-use pump

Many an engineer can save his company from obsolete pump waste . . . by specifying this new Taber "General-Use" pump with the special "interchanging" feature that adapts it for more than one job. It's fully described in helpful Bulletin CLVS-339, which we will gladly send to you on request. Write today. This pump is OK for most any processing system. Taber Pump Co., 294 Elm St., Buffalo, N.Y. (Est. 1859)



No "SCENIC RAILWAY" PRESSURE HERE!

STURTEVANT CENTRIFUGAL COMPRESSORS

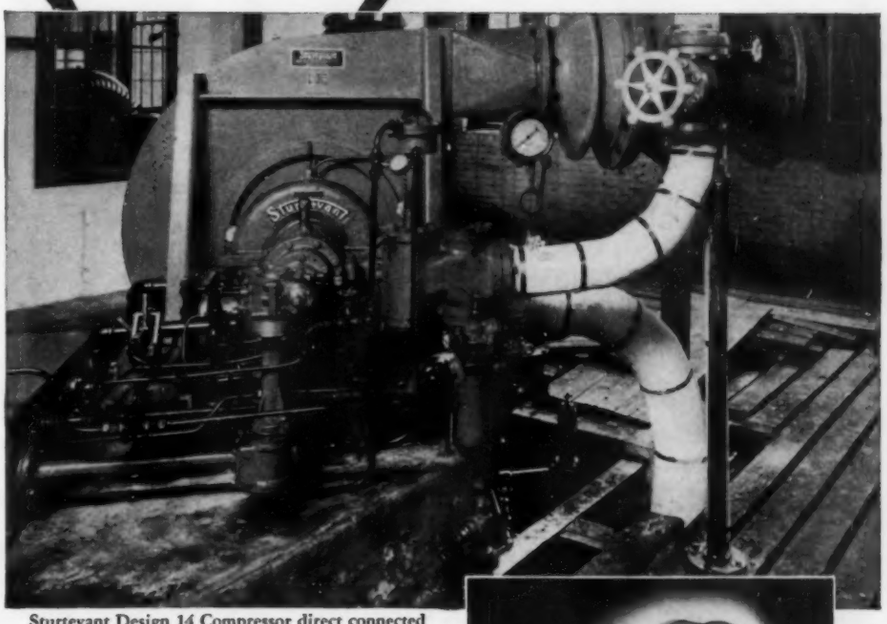
assure constant pressure over practically complete volume range

YOU DON'T have to fuss around with valve adjustments to maintain required pressure, when operating a Sturtevant Centrifugal Compressor under variable loads. It automatically maintains pressure over practically complete volume range.

Volume automatically adjusts itself to demand. And power consumption decreases proportionately with decrease of volume.

Other important features of these Sturtevant Centrifugal Compressors, which make them ideal for industrial duty, are:

1. Simple, compact design – overhung wheel construction, commonly used, eliminates two bearings and coupling. Saves space; reduces maintenance.
2. Requires Minimum attention—lubrication of motor bearings two or three times yearly only care required. Skilled operators unnecessary.
3. Lifetime efficiency—only parts in contact are motor bearings; there are no close clearances. Therefore, wear reduced to a minimum and lifetime efficiency maintained.



Sturtevant Design 14 Compressor direct connected to Sturtevant Steam Turbine—installed in plant of Consolidated Gas Company, Everett, Mass.

Entire unit is very compact; occupies minimum floor space.

Sturtevant Design 9 Single Stage Centrifugal Compressor direct connected to electric motor.

B. F. STURTEVANT COMPANY
Hyde Park Boston, Massachusetts
Sales Offices in 40 Cities
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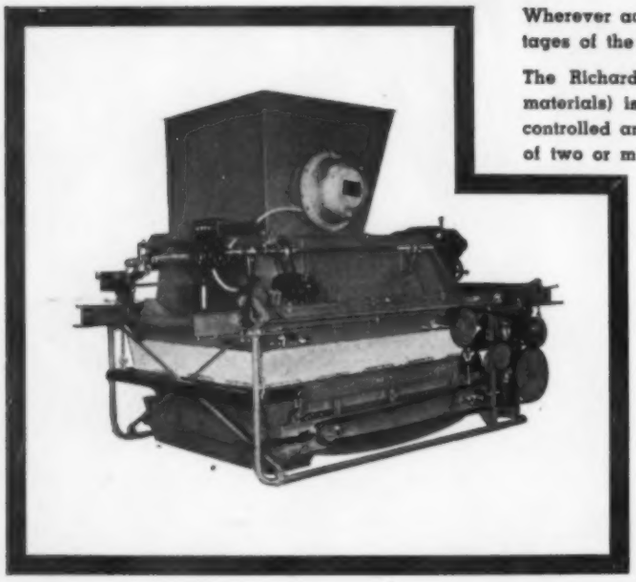
WRITE FOR CATALOG 386-1

Contains complete information regarding Sturtevant Centrifugal Compressors and their many advantageous features which assure excellent compressor performance, very high efficiency, and low maintenance cost.

Sturtevant
REG. U. S. PAT. OFF.
Puts Air to Work

WORLD'S LARGEST MAKER OF AIR HANDLING EQUIPMENT

HOW CONTINUOUS AUTOMATIC WEIGHING CAN SAVE YOU MONEY



Wherever accurate measurement of materials in process is necessary, the advantages of the Richardson CONVEYOMETER should be investigated.

The Richardson CONVEYOMETER (adaptable for nearly all capacities of all materials) is a combined conveyor, feeder, and scale, providing (1) accurately controlled and recorded feeding of single materials, and (2) correct proportioning of two or more ingredients prior to blending.

These heavily-constructed units can save you money by eliminating hand weighing, recording of weights and manual feeding of ingredients; or, if conveyors are now used, by eliminating "catch pans" or "test runs" with the manual weighing and computing operations involved.

Richardson CONVEYOMETERS are widely used for feeding lime to hydrators, saltcake to mixing tank, bauxite to mixers, proportioning soda ash and phosphate rock, feeding sand and coke to furnaces, and similar processes.

All CONVEYOMETERS are self-checking and self-adjusting.

Write for Bulletin 21235-E.

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RICHARDSON SCALE COMPANY, CLIFTON, N. J.

SAFEGUARD WORKERS *against*

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FUMES
GASES
SMOKE
SPRAY MISTS

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New, illustrated folder, "Safe Handling of Acids & Chemicals." Write today for your free copy.

Pulmosan Respirators give a greater measure of the features that count . . . safety, comfort, lightness, ease of breathing, serviceability. There's a type for every hazard and operating condition. Tell us your needs. Test a Pulmosan Respirator recommended specifically for your requirements.

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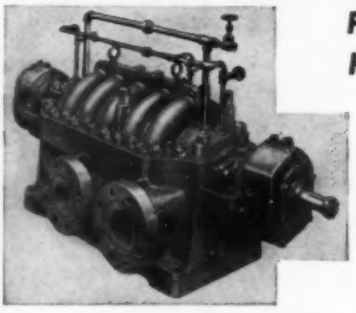
Dept. CM, 176 Johnson St., Brooklyn, N. Y.

There's an Efficient

BYRON JACKSON PUMP

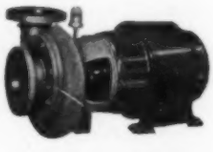
For Every Fluid Handling Need



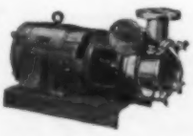
HIGH PRESSURE MULTI-STAGE PUMPS

are unequalled for boiler feed, for booster service, pipe line and other work. They deliver from 75 to 4000 gallons per minute at heads up to 3,500 feet. Send for Bulletin.

BYRON JACKSON BILTON PUMPS



are ideal for general service in every industrial plant. The single stage (illustrated) handles from 25 to 800 gallons per minute at heads up to 250 feet; the two-stage delivers these capacities at heads up to 500 feet. A detailed Bulletin is ready for you.



SANITARY FOOD PROCESS PUMPS

of stainless steel construction are designed to be taken apart rapidly and easily for cleaning and sterilizing. Inquiries should give details of intended service.

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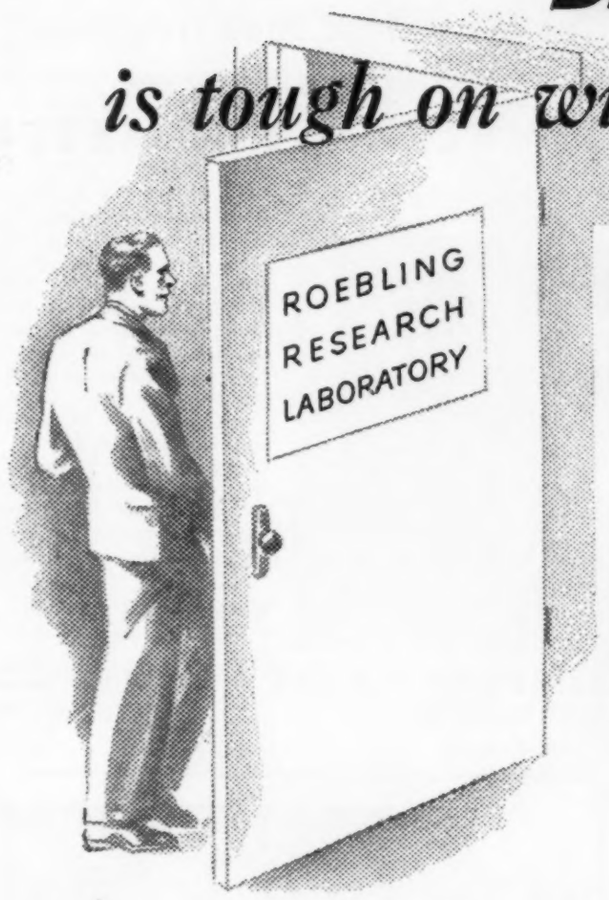
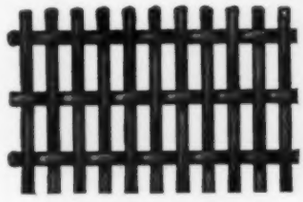
The "FROM MISSOURI" DEPARTMENT

is tough on wire screening!

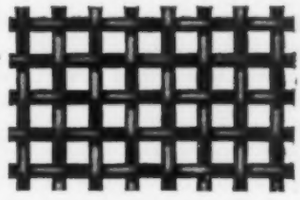


"Sweetland Style" Twilled Weave Filter Cloth

Dutch Weave Twilled Filter Cloth



Oblong Mesh Wire Screen



Square Mesh Wire Screen

ACTUAL SERVICE is plenty tough enough on wire screening and metallic filter cloth. But our Research Laboratory — our "From Missouri" Department — are even tougher. And they have no sympathy for screening or filter cloth that can't "take it".

Their job is to make certain that Roebling Wire Screening and Metallic Filter Cloth are always more than able to meet severe service conditions —to make certain that when you buy these products you will get the last word in long, economical service. Therefore, Roebling Research goes on unceasingly, on a planned basis — Roebling Wire Screening and Metallic Filter Cloth are constantly subjected to laboratory tests that often exceed in severity the toughest of actual service conditions.

When you install these Roebling Products you can do so with full confidence that no stone has been left unturned to make them the finest obtainable.

You can obtain Roebling Wire Screening in practically any metal—to meet a wide range of requirements as to strength, rigidity, flexibility, precision, or resistance to heat, steam, water, acids, etc. We invite your inquiry for complete information.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, N.J. *Branches in Principal Cities*

ROEBLING WIRE SCREEN

TRADE JERSEY MARK

90 YEARS OF WIRE MAKING SPELLS THE DIFFERENCE

"FIX ME UP Another Layne Well"

Promises are made easily but performance is the only factor which speaks with absolute conviction. Performance depends upon quality and proven engineering. There are on record hundreds of cases where the installation of the first Layne Well and Pump automatically brought repeat orders for additional units, as the need for water increased. In some instances the record is as high as forty units for a municipality. Many industrial plants have ten, twenty, and up to twenty-five Layne Well Water Supply Units, installed over a period of several years.

Of all equipment, wells and pumps should be most dependable. Shut-downs for repairs are very expensive. Layne appreciates the value of uninterrupted service and builds its water supply and pumping systems to give maximum trouble-free service. Quality is not sacrificed to reduce prices or meet cheap competition.

If in need of water, investigate the outstanding features of Layne Wells and Pumps. Illustrated bulletins may be obtained by addressing

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LAYNE

PUMPS & WELL WATER SYSTEMS

For Municipalities, Industries, Railroads, Mines and Irrigation

The Same Device

that flies this ship operates the new

SIMPLEX GYROMETER

Now, for the first time, gyroscopic force actions as employed in compasses and stabilizers have been utilized to measure the flow of fluids. While the mathematical theory of the gyrometer is somewhat complex its design is simple and its performance both accurate and positive. Through a wide range of connections the Simplex Gyrometer is adaptable to any primary device, any size main, any capacity and any fluid from water or corrosive liquids to steam and gas . . . The price? Very reasonable.

Write us today for interesting technical data

SIMPLEX VALVE & METER CO.
6780 Upland Street **Philadelphia, Pa.**

For BREAKING UP CHEMICALS, GASES, ETC.

Ideal equipment for breaking up chemicals and other materials so necessary in process manufacturing, or for washing gases, etc., Murray Spray Wheels cannot be clogged at any time. They are self-cleaning and fool-proof . . . lowest possible maintenance cost. The type illustrated here may be installed singly or in multiples, and the spray produced can be either fine, medium, or coarse to meet specific applications. Send us your specifications. We will gladly help you solve your problems.

D. J. MURRAY MFG. CO.
WAUSAU, WISCONSIN
Established 1883

Let's Talk About Your Corrosion Problems

Few industries are entirely free from corrosion difficulties. In almost every industrial plant is at least one piece of equipment of steel, wood or other material which, because of corrosion, now requires periodic repair or replacement.

Only in rare cases is periodic repair or replacement of equipment, caused by the ravages of corrosion, an inevitable and necessary evil, about which nothing can be done.

However, it is possible that trouble-free equipment can be fabricated of corrosion-resistant metal, and subsequently give years of satisfactory service.

Obviously, no one can expect to buy corrosion-resistant equipment for the same price as equipment built of steel or wood. But when the cost of corrosion is carefully calculated, it is often found that ultimate cost is lower with the corrosion-resistant unit that is higher in initial cost.

Perhaps contamination of some products, caused by corrosion of ordinary metal equipment, is also a problem. In such cases, where purity and quality of product are vital factors, corrosion-resistant equipment is of even greater importance.

If harmful contamination — often caused by only a small content of metal salts — can be eliminated, undoubtedly a product of higher purity, of better quality, can be produced. Usually, it will command a higher price and a better market. Thus, corrosion-resistant equipment may quickly pay for itself, and then continue on to increase profits for its purchaser.

What are *your* corrosion problems? What is the nature of the corrosive materials, their concentrations, temperature and degree of aeration?

Over a period of years, considerable data has been accumulated on the corrosion rates of various metals under a wide variety of conditions. Some of this information may be of dollars and cents value to you. Tell us your corrosion difficulties by letter.

Syrup room in plant of nationally-known tobacco manufacturer, showing vessels built of Lukens Nickel-Clad Steel (sheathed outside with Monel sheets for appearance) by Youngstown Welding & Engineering Co., Youngstown, Ohio. 15% Nickel-Clad plates, ¼", ⅜" and 5/16" thick, were used.

Clean, Corrosion-Resistant Tobacco Processing Equipment

Built of Lukens Nickel-Clad Steel

In several steps in the preparation and processing of tobacco, corrosive conditions and their ever-present problems are encountered. Leading tobacco companies spend large sums yearly to provide and maintain corrosion-resistant equipment, in order to produce a clean, improved product.

For more than a year, a leading tobacco company has had in service a battery of seven steam-jacketed vessels, fabricated by Youngstown Welding and Engineering Co., Youngstown, Ohio, of Lukens Nickel-Clad Steel.

The vessels are employed in the preparation of syrup which is used in the flavoring of a nationally famous brand of tobacco.

All seven units are insulated and their exteriors, including tops and monitors, are sheathed, for appearance, with lustrous Monel sheets, as the syrup room in which they are installed is a show place of the plant.

Of the seven vessels, four serve as dissolving tanks with agitation supplied by centrifugal pumps. One unit is used as a mixing tank. Two are used as pressure vessels, equipped with metering devices for addition of the casing solution to the tobacco.

After the solids have been transformed into liquids in the dissolving tanks, the solutions pass into the mixing unit in which certain substances are added, and thence fed to the pressure vessels in which the casing solution is applied.

In tobacco processing, another application of Lukens Nickel-Clad Steel is in the fabrication of conditioning or "ordering" cylinders, built usually in the past of ordinary steel, lined with cypress wood. Wooden linings, after a comparatively short period of service, require replacement and thus involve constant maintenance expense. With cylinders of Nickel-Clad Steel, replacement of linings would be eliminated, and the equipment should render years of excellent service with practically no maintenance expense. In addition,

This article is completed in "Clad News," Vol. 1, No. 4, published by Lukens Steel Company, World's Largest Plate Mill, Coatesville, Pa. Write for a copy, or for further information on Lukens Clad Steels.

LUKENS STEEL COMPANY
World's Largest Plate Mill
COATESVILLE, PA.

WRIGHT *Improved High Speed* HOISTS ARE ALWAYS RIGHT

★ The Wright Hoist is always right because it always handles the hoisting jobs with speed and economy.

Precision load wheel bearings provide fast, smooth, positive action. There is a load chain safety guard that makes it impossible for the load chain, regardless of its position, to ride out of the pocket. There is no corrosion to fear. Zinc-coating prevents it.

These are only three of the 21 features that make the Wright Improved High Speed Hoist the hoist for fast, convenient, low-cost operation.

Wright Hoists, Trolleys and Cranes, in capacities from ¼ to 40 tons, are described in the new Wright Catalog. Write for your copy.

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BUY ACCO QUALITY *in Wright Hoists, Cranes and Trolleys; Tru-Lay Preformed Wire Rope; Reading-Pratt & Cady Valves; Campbell Abrasive Cutting Machines; American Chains; Page Welding Electrodes and Page Wire Fence.*

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Karcite Sink No. S-675

Karcite is a remarkable new ceramic material of fine uniform texture, the pores of which are filled with carbon. It can be molded into unusually large sizes and in complicated shapes—eliminating all seams. Sinks made from Karcite—

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When ordering Laboratory Furniture, specify Karcite Sinks. Now distributed by most leading Laboratory Furniture Manufacturers.

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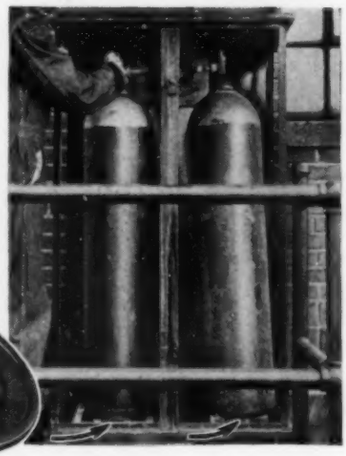
ELECTRIC HEAT prevents stoppage in flow of SO_2

As these cylinders of sulphur dioxide gas discharge their contents, the resultant sharp lowering of cylinder temperature and freezing up of discharge pipes is prevented by 500-watt Chromalox electric heating units of ring type, mounted just below each cylinder. Thermostatic control makes attention unnecessary, and holds the gas temperature at the ideal point for constant use.



Chromalox electric ring units, as used in this application. These are available in diameters from 2½" to 11" and in capacity up to 1800 watts. Many other types and forms of Chromalox electric heating units are serving industry in a multitude of ways.

The full advantages of electric heat are assured in any application by the expert cooperation of Wiegand electric heat specialists, at your service upon request. For general information, the 64-page Chromalox Book of Electric Heat is considered by many engineers as a valuable reference manual. Write for a copy.

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THIS view shows a welded refinery tower 8 ft. 7 in. in diameter by 67 ft. 9 in. long coming out of the stress-relieving furnace at our Birmingham plant. It has since been installed at Ponca City, Okla.

We are equipped to fabricate heavy welded pressure vessels of all types to API — ASME specifications at all of our plants. In addition, we have facilities for x-raying and stress-relieving such vessels at Birmingham.

All of our welders are required to pass strict qualification tests. All joints are carefully inspected and tested as specified.

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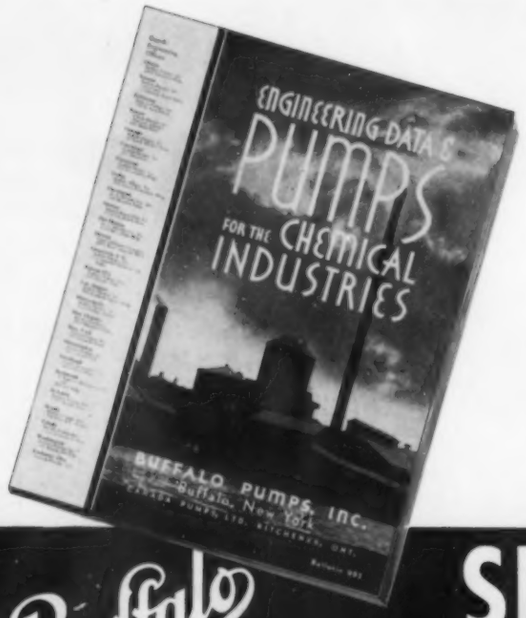

• What is your special chemical pumping problem? Whatever it is, the chances are pretty good that you'll find in this new comprehensive bulletin, pumps that are just the right size and correct metals to give you efficient, trouble-free service.

• *Send for your copy today.*

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CANADA PUMPS LTD., KITCHENER, ONT.

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for the Chemical Industry

Carey 606 SUPER CEMENT
PLASTIC MONOLITHIC
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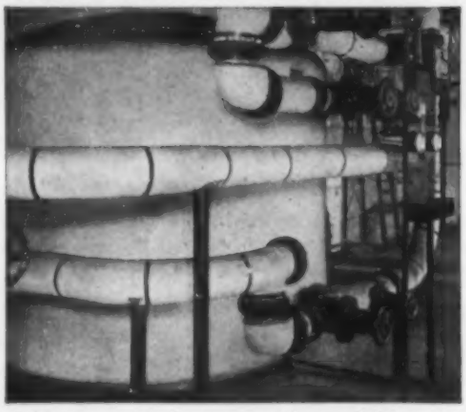

Ideal for process equipment; can be used for any temperature up to 1600° F. Easily applied to large or small surfaces. Extremely high insulating efficiency; minimum lineal drying shrinkage; remarkable adhesive properties; extreme plasticity; surprisingly low cost because of its great covering capacity. Write Dept. 15 today for complete details or consult the nearest Carey Branch or Distributor.

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for
POWER AND PROCESS STEAM, AND COMPRESSED AIR

Made of long fibre asbestos, lubricated for modern temperatures.

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Send for ABC chart of Packing Services. Sent without obligation on your part.

GREENE, TWEED & CO.
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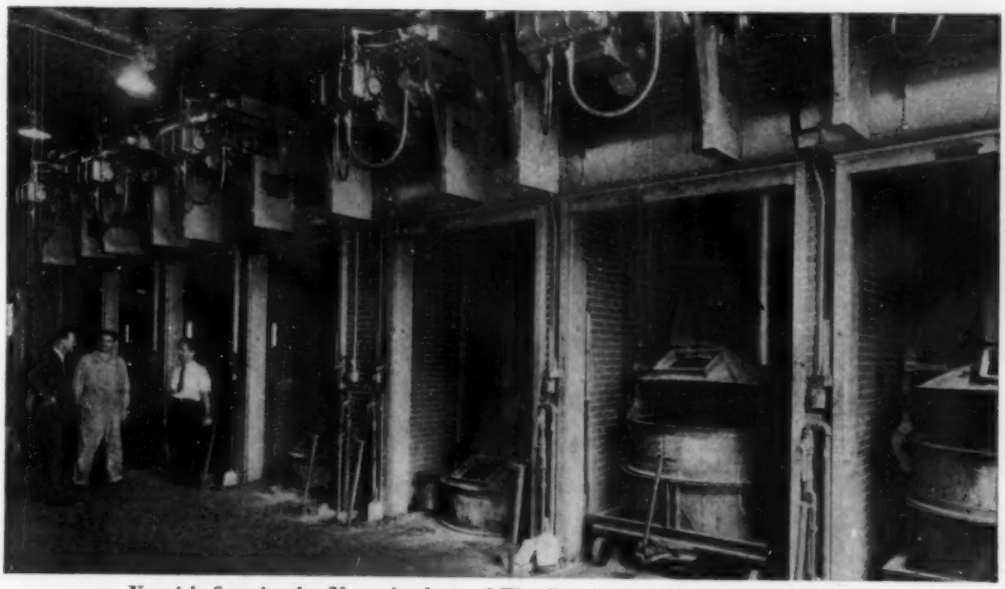
Cooking Modern Varnishes

. . . another *made-to-order* Job for GAS



Varnish fires in the Newark plant of The Pittsburgh Plate Glass Company.
Photograph courtesy Public Service Electric and Gas Company, Newark, N. J.

VARNISH cooking is a critical, exacting operation. It requires above all else speedy, controllable heat. In the Newark, N. J., plant of the Pittsburgh Plate Glass Company, this responsibility is placed upon Gas, as the illustration of the series of varnish fires shows.

When it comes to the important job of providing the exact amount of heat where needed and when needed, such as in varnish or paint manufacture, Gas is the accepted fuel in industry. It is quick heating, clean, accurately controllable, and modern equipment has been developed that will take full advantage of these important properties. Each year sees Gas contributing more and more to the achievements in chemical and metallurgical fields, for drying, roasting, reducing, melting, distilling, evaporating, sintering, and scores of other heat using operations.

If you will check each heat-requiring step in the manufacture of your product, you will find several points at which Gas may be able to benefit you, and bring out new profit possibilities. Why not investigate Gas for your plant?

AMERICAN GAS ASSOCIATION

INDUSTRIAL GAS SECTION

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by rumor, guesswork, and hasty judgment

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TIME was when buying advertising space seemed like groping in the dark. With no facts to serve as guide through the mysteries of circulation, you had to rely on rumor and hearsay. You had to pick your papers by guess-work . . . and hope for the best results as far as sales were concerned.

That day is past. Discerning advertisers now buy space with as sound a basis of fact as they buy a ton of coal or a dozen of eggs.

The source of this enlightenment is the A.B.C. report—the complete official, audited report of circulation facts. A.B.C. reports reveal and analyze NET PAID CIRCULATION—how large it is, where it is, how it was secured.

It is your insurance that you will get what you pay for. It protects the buyer and the honest publisher. It is made possible by over 2000 publishers, advertisers and advertising agencies. Together they provide you with this insurance policy. Use it. It costs you nothing. It may save you much.

We will be glad to give you a copy of our latest A.B.C. report, containing the facts by which you can judge the value of this paper.

ABC **CHEMICAL** & METALLURGICAL **ENGINEERING** ABP

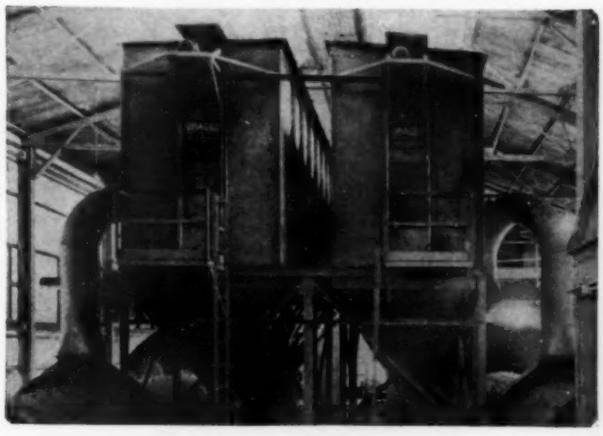
"One of Industries Great Papers"

A.B.C. = Audit Bureau of Circulations = FACTS as a yardstick of advertising value

ARE YOU LOSING VALUABLES *that* DRACCO FILTERS *can recover* ?

Write for Discriptive Bulletin

Many Chemical Plants—TODAY—are losing valuables that can be recovered with DRACCO Filters. It is surprising how much money is lost in this way. Even if the material you lose is of no value—Dust in small or large quantities should be controlled. Dust is a destructive element that NEVER PAYS—in fact it ALWAYS CAUSES A LOSS. DRACCO Filters often pay for themselves from the valuables recovered. It will pay to check and learn the true condition in your Plant—the results may surprise you.



This Installation Recovers 7½% of Grinding Capacity

Consult DRACCO Engineers

To make occasional checks on your Dust problem is a sound business practice. DRACCO Engineers have over 25 years experience in solving Dust problems of every description. They are, therefore, well qualified by practical experience to suggest the best and most economical way of solving your particular problem.

• For Further Information Write •

DRACCO CORPORATION

Successors to The Dust Recovering & Conveying Co.

4071 E. 116th St. **Cleveland, Ohio**

New York Office, 130 W. 42nd St.

PNEUMATIC CONVEYORS • DUST COLLECTORS

MONARCH

HARD RUBBER

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Patented Fig. B-27 illustrated produces a fine, evenly distributed hollow cone spray. "Non-clogging" as it contains no internal slots or vanes—simply a single large tangential inlet. Relatively simple construction makes this nozzle least expensive hard rubber type.

Capacities from 5.7 to 800 g.p.h. at 10#.

Other types available in capacities to 34.5 g.p.m. at 10#.

STONEWARE SPRAYS

Monarch stoneware nozzles have replaced other sprays in most plants throughout the world because they do not break or crack from temperature changes, and produce finest most uniform spray possible.

Do you have Catalog 6-C?

MONARCH MFG. WORKS, INC.

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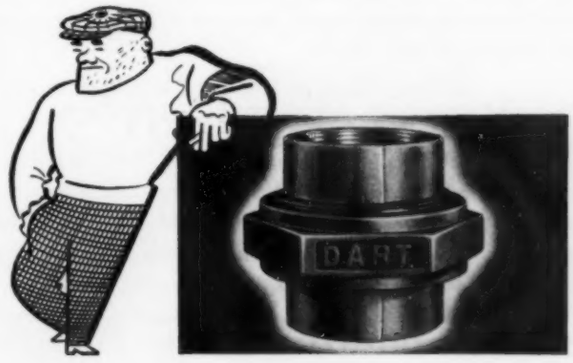

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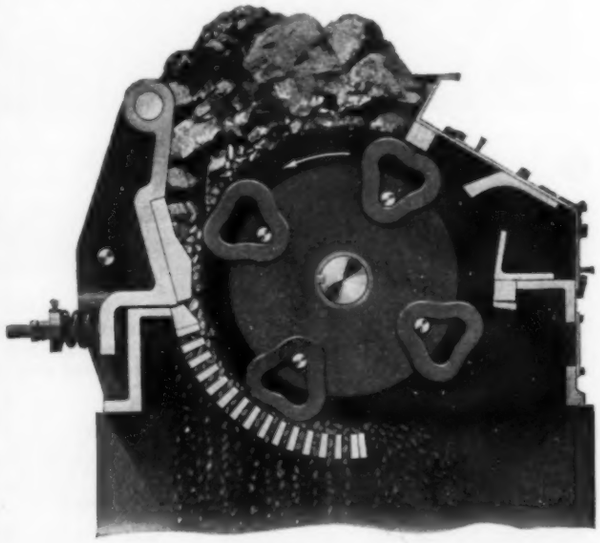

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Making Use of its Adhesive Properties

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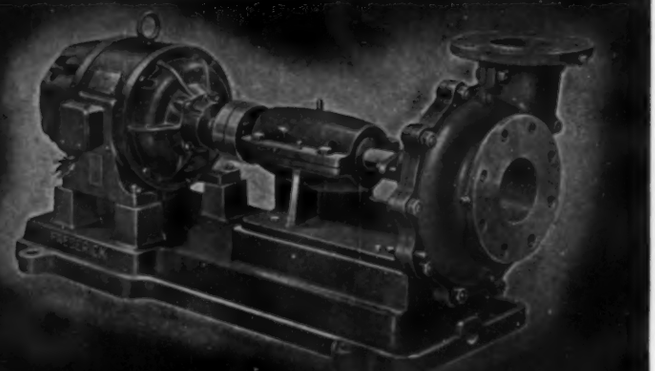

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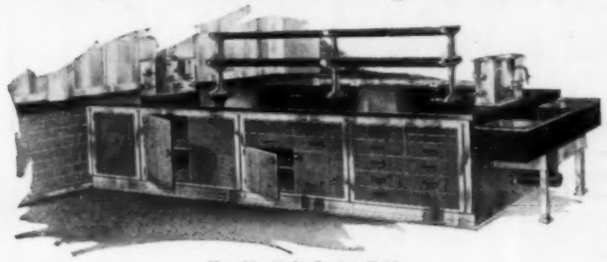

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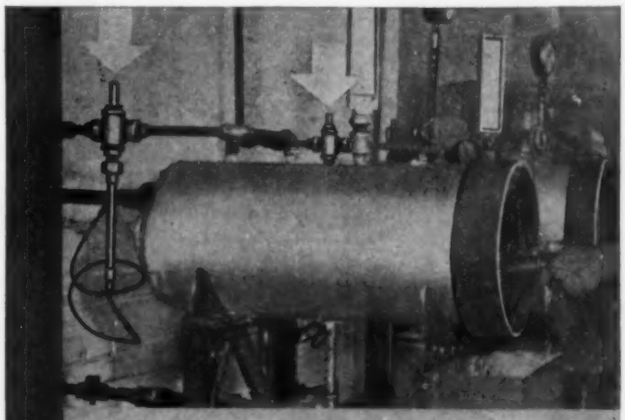

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High ACCURACY is maintained on these two vulcanizers in the laboratory of the Rodic Rubber Corporation, Garwood, New Jersey, with Sarco TR-21 Control. The temperature is held at 300 degrees. Temperature dependability with laboratory precision can be applied to production operations as well.

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These simple and sturdy instruments are standard equipment on hot water heaters of all types, and are used in industry to maintain constant temperatures in all types of process equipment.

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This Hopper, made of ⅜" plate, filling a space 8 ft. sq., has NO TWO SIDES ALIKE because the manufacturer's requirements necessitated our fabricating this most unusual design. We invite your inquiries concerning the fabrication of any special equipment you may need in YOUR production.

ASME code welding in all metals shown in the border excepting silver. Call upon our engineering experience to help solve your problems.

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Clear California Redwood pipe has greater carrying capacity than metal or concrete pipe. Does not clog, scale or pit. Light weight. Easily installed. Not affected by electrolysis, worms, frost and resists heat. Use it for sewage, liquors, acids, water, heavy fluids containing grit — for flumes, fume ducts, etc. Sizes 1" and up. Pressures at 172 lbs. We also manufacture Redwood Underground Steam Pipe Castings. Lengths up to 12 ft.

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Nationally known for their quality of materials, construction and performance.

Built by an organization that has made kettles for more than 66 years.

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We also manufacture tanks of other types for all purposes, as well as towers, standpipes, vats, boilers, etc. Let us know your needs in fabrication! *Write for "Tank Talk" No. 25-B.*

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ESTABLISHED 1854
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STAINLESS STEEL UNITS

Rex-Bellows Units have all the qualities of 18-8 stainless steel — corrosion resistance and durability; higher resistance to fatigue, vibration and continued bending movement. Available in fully corrugated form, and in straight and divided form as illustrated.

Fittings welded by electric resistance circumference seam welding process, forming a completely sealed, leak-proof connection free from soldered, brazed or torch welded joints of any kind. Available in standard pipe sizes from 3/8" to 2" I.D., and assembled to specifications with required fittings.

Rex-Bellows Stainless Steel Units meet a great variety of industrial needs, where resistance to corrosion and high temperatures are factors.

Made in single, double and triple ply to suit the conditions involved. Also, supplied with metal braid covering to withstand higher pressures and to provide additional external protection.

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Homestead Lever-Seald Plug Valve. Cannot stick. No lubrication or upkeep required.

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1. ***Protected Seating Surfaces*—No fluid or grit passes over valve seats—Long continuous service.**
2. ***Instant Action*—Powerful leverage and screw guarantee operation even on high temperature, high pressure, or corrosive services.**
3. ***No Lubrication Required*—Valve sealed in any position by screw lever.**
4. ***No Upkeep*—No attention or upkeep is needed. "Lever-Seald" principle assures constant readiness for quick operation in any emergency.**

Homestead Lever-Seald Valves are made in sizes from 1½" to 10", and cast in bronze, iron, steel, Ni-Resist, Monel, and other metals for handling steam, oil, water, gas, chemicals, etc. Order some for your next valve requirements.

Send for Valve Reference Book No. 38 for complete information. Consult our engineers about your special valve problems. No obligation.

HOMESTEAD VALVE MANUFACTURING CO.
P. O. Box 13 Coraopolis, Pa.

HOMESTEAD VALVES

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YOUNG CHEMICAL ENGINEER wanted with 3 to 5 years experience preferably some in petroleum work. Reply giving full details of education, experience, present position, location, and salary expected. Furnish photograph and references. P-926, Chemical and Metallurgical Engineering, 330 W. 42nd St., New York, N. Y.

ENGINEER WANTED—Experienced in extruding plasting materials. P-927, Chemical and Metallurgical Engineering, 330 W. 42nd St., New York, N. Y.

PH.D.—PHY. CHEMIST with few years industrial research experience. Capable of assuming charge of Research Dept. after period sufficient to acquaint him with the problems of the industry. Give details of education, experience, and salary expected. Location—Midwest. P-928, Chemical and Metallurgical Engineering, 520 N. Michigan Ave., Chicago, Ill.

CHEMICAL ENGINEER and/or Physical Chemist with a broad training and experience in metallurgy and inorganic chemistry. Position has considerable research with varied and definitely practical applications. Give full details of experience in reply. P-934, Chemical and Metallurgical Engineering, 520 N. Michigan Ave., Chicago, Ill.

EMPLOYMENT SERVICE

SALARIED POSITIONS. $2,500 to $25,000. This thoroughly organized advertising service of 30 years' recognized standing and reputation carries on preliminary negotiations for positions of the caliber indicated above, through a procedure individualized to each client's personal requirements. Several weeks are required to negotiate and each individual must finance the moderate cost of his own campaign. Retaining fee protected by a refund provision as stipulated in our agreement. Identity is covered and, if employed, present position protected. If your salary has been $2,500 or more, send only name and address for details. R. W. Bixby, Inc., 260 Delward Bldg., Buffalo, N. Y.

POSITIONS WANTED

(*See also "Selling Opportunity Wanted"*)

CHEMICAL ENGINEERING EXECUTIVE. **Fifteen years sales, advertising, construction, research, patents. Widely traveled. Three languages. Responsibilities.** PW-897, Chemical & Metallurgical Engineering, 330 W. 42nd St., New York, N. Y.

CHEMICAL-SAFETY ENGINEER University of Illinois. Twenty-five years industrial experience including twelve years in prevention of occupational diseases; research, design and consultation on ventilation for vapors, fumes and dusts; several publications and patents; desires connection with firm having tough toxicity problem where tact and understanding of labor difficulties are essential. PW-915, Chemical & Metallurgical Engineering, 330 W. 42nd St., New York, N. Y.

ANALYST. Mature. Long, varied experience in process control and research analyses for the metal, chemical, glass and electrical industries, seeks position where dependable, rapid technique can be utilized. Moderate salary. PW-924, Chemical and Metallurgical Engineering, 330 W. 42nd St., New York, N. Y.

CONSULTANT, coal tar distillates, intermediates, dyes, coke over by-products. PW-925, Chemical and Metallurgical Engineering, 330 W. 42nd St., New York, N. Y.

CHEMICAL ENGINEER, Physical Chemist M.SC, 31, married. Seven years experience in petroleum technology, also research in inorganic. Desires position as process engineer or research chemist in any industry. Excellent references. N. Y. area. PW-929, Chemical and Metallurgical Engineering, 330 W. 42nd St., New York, N. Y.

CHEMICAL ENGINEER

Large industrial company with chemical plant in the East has opening for experienced engineer. Applicants should have Master of Science degree in Chemical Engineering and from 10 to 15 years of practical experience in equipment design, plant layout, construction and maintenance.

Reply, in confidence, giving full details of your training, experience and special qualifications, state nationality and salary requested and attach small photograph. Our own staff is advised of this advertisement.

P-923, Chemical and Metallurgical Engineering
330 West 42nd St., New York City

POSITIONS WANTED

COLLOID AND PHYSICAL CHEMIST, PHD October 1939—Large midwestern university. Minor, biochemistry. Research fellow, Sigma Xi. Desires industrial position where broad fundamental training can be put to use. Excellent references. PW-930, Chemical and Metallurgical Engineering, 520 N. Michigan Ave., Chicago, Ill.

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COST ACCOUNTANT. Ten years diversified responsible experience in chemical industry, principally accounting, systems, and standard costs. Active in professional societies, publications, M.I.T. Graduate in Chemical and Industrial Engineering. Location New York or vicinity. Age 31. PW-933, Chemical and Metallurgical Engineering, 330 W. 42nd St., New York, N. Y.

CHEMICAL ENGINEER, M.Ch. E., 24. Research, teaching, drafting, (some sales) and plant experience. Desires plant or sales opportunity. Though employed, salary is secondary. Interview anywhere. PW-935, Chemical and Metallurgical Engineering, 330 W. 42nd St., New York, N. Y.

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Crushing, Screening and Coloring Plant

EMERALITE ROCK PRODUCT CO.
Ely, Minnesota

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17—**Tyler Hummer Vibrating Screens,** 3'x5', 4'x5', double, triple deck.

3—**Leahy Mechanical Screens,** 3'x5', 4'x7', single, double deck.

4—**Sturtevant Moto-Vibro #2,** 3'x6', double deck.

1—**Carroll 24x36" Jaw Crusher**

1—**Universal 8x36" Jaw Crusher,** manganese equipped.

2—2' Symons Cone Crushers.

1—#37 **Kennedy Gearless** Ball Bearing **Gyratory Crusher.**

7—Sets **Allis Chalmers** 24" dia. x 14" **Crushing Rolls:** 2—30" dia. x 14" Allis Chalmers; 1—20" dia. x 14" Sturtevant; 1—36" x 16" Sturtevant.

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1—5'x30' Buckeye Rotary Direct Heat Dryer; 1—4'x30' Amer. Process; 1—4'x40' Ruggles-Coles.

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Representative on premises—arrange for inspection.

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1—9' **Copper Vacuum Coil Pan.**

1—**Kilby 7' Calandria Vacuum Pan.**

1—**Lummus** 500 gal. **Copper Jack. Vacuum Pan.**

5—**Oliver Filters** 3'x2', 6'x4', 6'x6', wood and iron, 8'x8', 8'x12' iron.

8—**Sweetland Filters,** Nos. 12, 11, 10, 9, 7, 5, 2, and laboratory sizes—copper, iron and monel leaves.

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65—**Centrifugal Machines** from 12" to 72", bronze & steel baskets, belt & motor dr.

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1—5'x30' **Ruggles Coles** Class "A" **Rotary Dryer.**

9—**Rotary Dryers:** 3x20' 4x30', 5x30', 6x40', 6x60', 8x60', 8'8"x85'.

10—**Devine Vacuum Shelf Dryers,** No. 6, No. 5, No. 1, No. 12, No. 23, No. 26, No. 27, No. 30.

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8—10'x30' **Vertical Steel Storage Tanks,** 18,000 gal.

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1—30"x36" **Gruendler Hammer Mill,** #4XC, roller bearings, with new manganese wearing parts.

14—**Vibrating Screens;** 3x5', 4x5', 4x7' Tyler Hummers: 30"x8'6", Robinson; Rotex 20x48", #41, #52, 4'x8'; Allis-Chalmers 4x8',3-deck.

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1—2'x4' **Marcy Rod Mill,** motor driven.

2—4 roll **Raymond High Side Pulverizers.**

6—**Raymond Pulverizers**—0000, 00, 1 & 3.

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1—24" **Mikro Pulverizer.**

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4—Patterson Silex Lined Pebble Mills, approx. 7' dia. x 5' face. Lining in excellent condition.

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4—900 gal. **Closed Agit. Jack. Steel Kettles.**

1—5 Roll 14"x36" Motor Driven **W.C. Steel Mill.**

1—**Ball & Jewell** #1 **Rotary Cutter.**

1—**Proctor** 6 **Truck Atmos. Dryer.**

1—#00 **Raymond Mill,** with Dust Collector.

1—**Pfaudler** 300 gal. **Glass Lined Kettle.**

1—**Duriron** 300 gal. **Open Top Kettle.**

1—**Huhn** 3'x8' **Rotary Steam Tube Dryer.**

1—**Burkhard** 200 gal. **Jack. Copper Vac. Still.**

18—**Pfaudler Glass Lined Tanks and Kettles.**

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4—**Williams Ball Bearing Hammer Mills.**

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7—Belted 173', 360', 528', 676', 1000' & 1300'.
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450 lb. **Sprout Waldron Mixer,** 3 H.P. motor dr.
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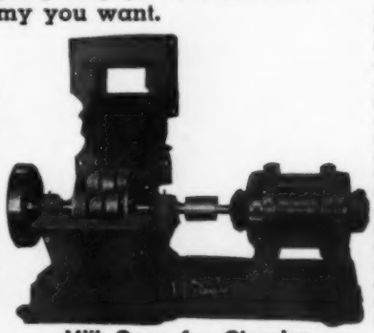

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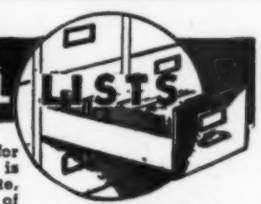

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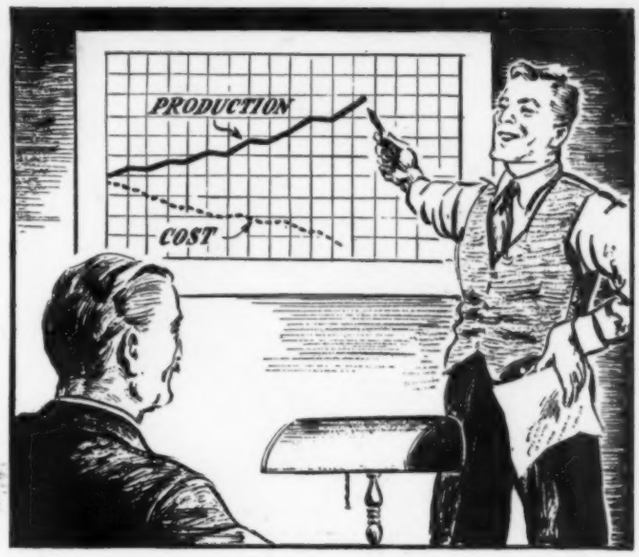

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The new Gayco Separator increases production QUALITY and QUANTITY and reduces production costs. These are facts, not simply claims—*actual results* of delivering a more UNIFORM product; with greater capacity, higher efficiency and ability to stand up under severe usage. In the light of such FACTS, keen minded Chemical Executives will see the wisdom of installing Gayco Equipment NOW, when the necessity for a closer control of production quality and expenses was never greater. GAYCO ENGINEERS will be glad to discuss Gayco PROVEN economies, in your plant.

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Coal Coke	Litharge	Sea Moss
Clay	Lithopone	Starch
Carbon Black	Lime, Caustic	Synthetic Resins
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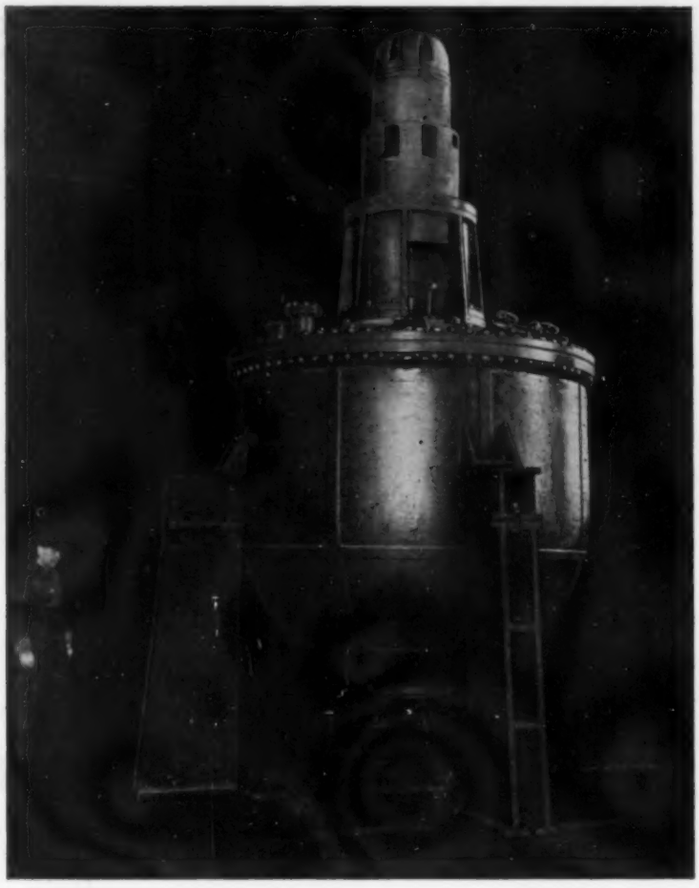

40% Saving in Operating Time . . .

THAT profit-making result is reported by an important resin manufacturer using the large BUFLOVAK Kettle shown in the upper illustration. Now, they are able to run 16 to 18 batches successively, without cleaning . . . formerly only 4 batches were possible.

Increased capacity has been obtained, because higher temperatures are possible with the individually controlled cast-in coils. Increased heat transfer and lower power consumption result from the advanced design of the agitator.

This kettle supplements another BUFLOVAK unit, that has rolled up nearly four years of continuous service, 24 hours a day, without a shutdown for any repairs.

Although your processing problem may be different, BUFLOVAK Engineers can help you build profits right at the start, with modern equipment that saves time, lowers costs and improves results.

Phenolic Resin is processed in this BUFLOWELD nickel clad steel kettle 500 gallons capacity.

Stainless Steel Reaction Kettle. Heated by radiant electric heaters.

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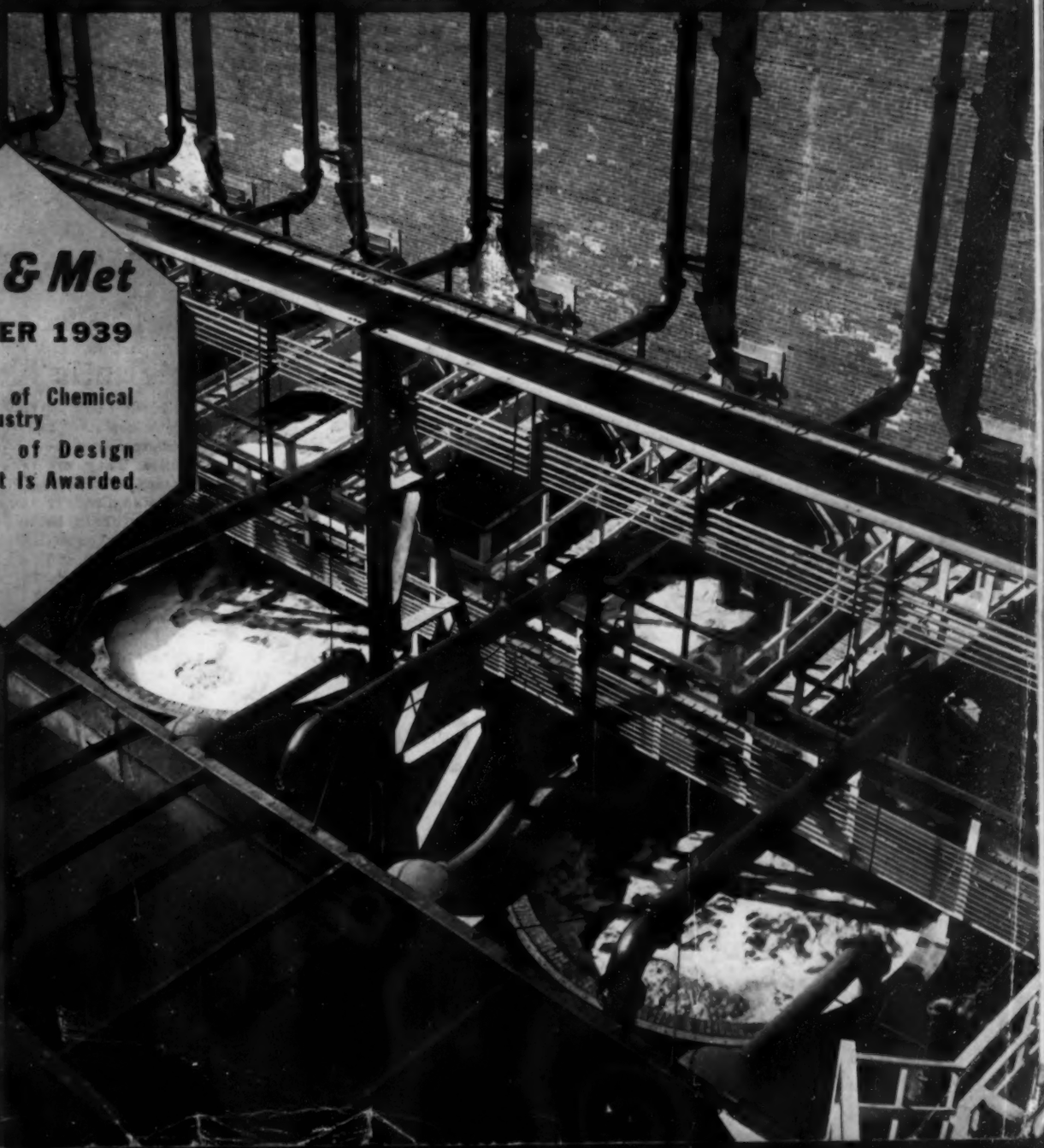

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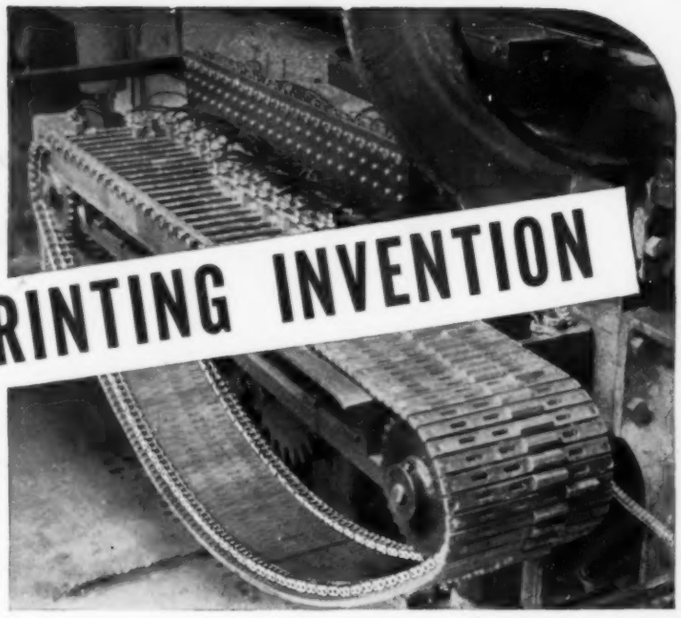
What Design Engineers are doing with Silverlink Roller Chain!



NEW RUG PRINTING INVENTION

an interesting application
of Silverlink Roller Chain

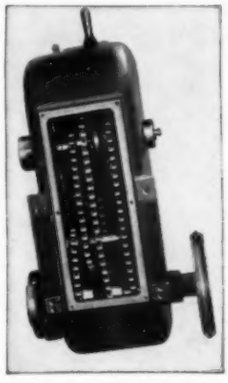
To make rug printing a continuous operation, Dienelt and Eisenhardt, Inc., Philadelphia, developed and patented an Electric Master Control in which they use two matched strands of Silverlink roller conveying chain. A good example of how ingenuity and Silverlink make effective teammates.

THE exceptional performance that is inherent to Silverlink Roller Chain has made it the favorite of leading design engineers and production men, for drives and conveyors. Its smooth, positive action—its rugged durability—its flexibility and good appearance make it the practical chain for countless applications.

Send for Data Book No. 1757—It contains 174 pages of meaty, illuminating information — list prices, ratings and bed-rock figuring and design data.

Link-Belt Company, Indianapolis, Chicago, Philadelphia, Atlanta, San Francisco, Toronto. Offices and distributors located in principal cities. 7648-C

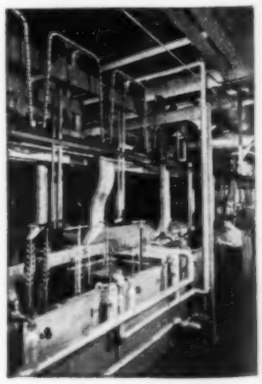
Costs Reduced with Silverlink Roller Chain



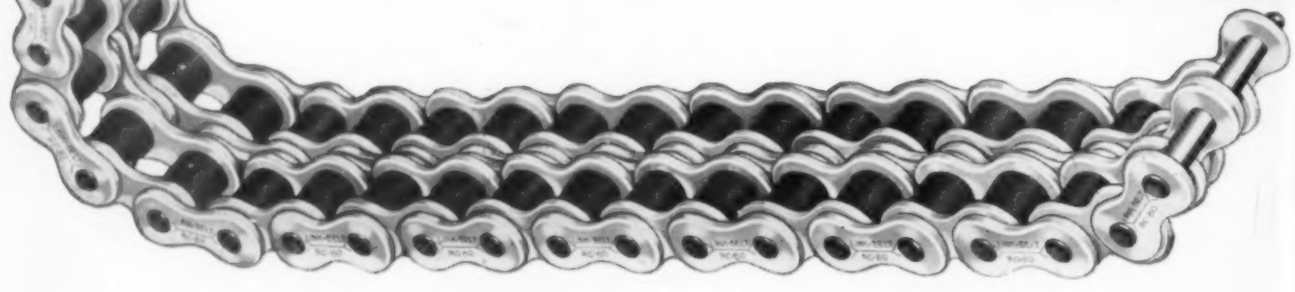
Because they developed their honing and reamingmachine with Silverlink Roller Chain as the internal transmission instead of a series of gears, the Automotive Maintenance Machinery Co., North Chicago, Illinois, were able to cut costs and keep their selling price advantageously low.

Automatic Metal Plating!

The Meaker Company, Chicago, design and build automatic plating and processing equipment for a wide variety of industries. They are constantly developing new applications of roller chain to meet unusual conditions of service and production. The installation illustrated is in a plumbing fixture plant and shows their Return-type, Full Automatic Metal Plating Unit in which Silverlink Roller Chain is used.



LINK-BELT
Silverlink
ROLLER CHAIN



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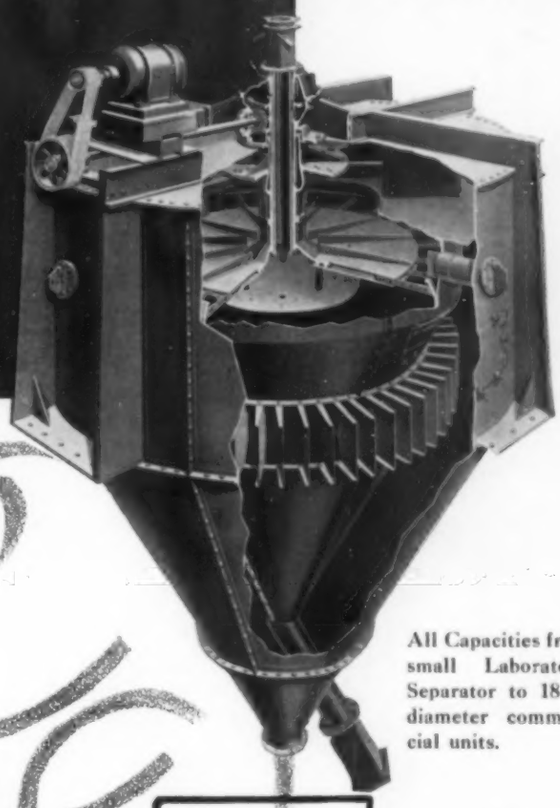
for CHEMICAL POWDERS and FOOD PRODUCTS

with RAYMOND WHIZZER SEPARATOR



All Capacities from small Laboratory Separator to 18-ft. diameter commercial units.

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Cocoa Powder
Walnut Shell Flour
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Cerolose Sugar
Diatomaceous Earth
Fine Pumice Stone
Shredded Wood Bark
Ground Senna Leaves
Chemical Hydrate
Dry Colors
Insecticide
Vacuum Dried Starch
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IF you want to produce super-fine materials in the low micron sizes, or obtain extreme uniformity in classification of powdered products . . . you can get these results economically and accurately with the Raymond whizzer-type Mechanical Air Separator.

It is equipped with single whizzer for commercial fineness and with a double whizzer for 350 to 400 mesh material. Will operate in closed circuit with any standard grinding mill. Built by the originators of air separation, and backed by a half-century of experience.

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